

**Review of the Dinematichthyini (Teleostei: Bythitidae) of the Indo-west Pacific.
Part IV. *Dinematichthys* and two new genera with descriptions of nine new species**

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ABSTRACT

A revision of the dincmatichthyine fishes (Ophidiiformes: Bythitidae: Brosmophycinae) of the Indo-West Pacific based on more than 6500 specimens is published in several parts. Part IV is the last part and includes 4719 identified specimens in the genera *Alionematichthys* (new genus with three described and eight new species), *Dinematichthys* Bleeker, 1855 (with one described and one new species) and *Porocephalichthys* (new genus with one described species). A neotype of *Dinematichthys iluocoeteoides* Bleeker, 1855 is here designated. The genera reviewed here have in common a high anterior nostril and are considered to be related to each other. When previously described, they were all included in the genus *Dinematichthys*. The separating characters of the species are the pseudoclasper morphology, morphometric characters, vertebrae and fin ray counts, otolith morphology, head squamation, presence or absence of the upper preopercular pore and development of cirri on the snout.

KEYWORDS: Viviparous brotulas, Indo-west Pacific, *Dinematichthys*, new species, new genera.

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INTRODUCTION

The global review of the dinematchthyine fishes, a tribe within the subfamily Brosmophycinae of the viviparous family Bythitidae, is concluded with this sixth part. The first two parts dealt with the American Dinematchthyini (Møller *et al.* 2004a, 2005) and were followed by four publications revising the Dinematchthyini from the Indo-west Pacific (Schwarzhans *et al.* 2005; Møller and Schwarzhans 2006; Schwarzhans and Møller 2007; this paper). The latest comprehensive account of ophidiiform fishes (Nielsen *et al.* 1999) contained 12 genera now regarded as valid in the Dinematchthyini, and 25 valid species. With the completion of the world-wide review of the Dinematchthyini, the current status of recognised taxa within the tribe has risen to 26 genera with 110 species.

The fishes described in this paper were previously referred to the genus *Dinematchthys*. Following Cohen and Nielsen (1978) and redefined by Cohen and Hutchins (1982) and Sedor and Cohen (1987), the position of the anterior nostril high above the upper lip, and about midway between the lip and the posterior nostril, was regarded as the main diagnostic character for the genus, distinguishing it from all other than known dinematchthyine fishes. In this review we conclude that the formal genus *Dinematchthys* “sensu lato” in fact contains three well defined groups for which generic rank applies: two more closely related ones – *Dinematchthys* with two species and *Alionematchthys* gen. nov. with 11 species – and one more distant monospecific genus containing *Porocephalichthys* gen. nov. *dasyrhychnus* (Cohen and Hutchins). The combining character of the high anterior nostril, reformulated to “positioned 1/3 or less of the distance from upper lip to anterior margin of eye” in Schwarzhans and Møller (2007), however, is not unique to these three genera and this distinguishing character has therefore become weakened. Similarly, high positioned anterior nostrils between 1/3 and 1/3.5 the distance from upper lip to anterior margin of eye have been observed in a few species of the genus *Diancistrus* Ogilby (for instance *D. allenii*, *D. atollorum* and *D. katrineae*), in *Ensireulhus pistillum* Schwarzhans and Møller and in *Lapitaichthys frickei* Schwarzhans and Møller. Fishes of the three genera *Dinematchthys*, *Alionematchthys* gen. nov. and *Porocephalichthys* gen. nov. can be easily distinguished from *Diancistrus* by the otolith sulcus showing distinctly separated colliculi (vs fused, undivided), from *Lapitaichthys* in the presence of two pairs of pseudoclasps (vs single pair of outer pseudoclasps), and from *Ensireulhus pistillum* in the flap-like inner pseudoclasps (vs stalked with sucker-disk tip) (see also key below). The diagnostic, distinguishing characters in the species of the three genera covered here are similar to those of the previous parts of our review. Again, pseudoclasps morphology represents the most useful character. However, pseudoclasps in the following three genera are smaller than in most other Dinematchthyini, with few exceptions, and are also less

diverse in most instances. Other useful characters for species differentiation are found to be head squamation, vertebrae and fin ray counts, morphometric measurements, otolith morphology, presence or absence of the upper preopercular pore and, new in this group, development of cirri on the snout. Of these, meristic counts show a lower degree of variation than in most other Dinematchthyini, and although individual species show statistically significant differences (average values), they are rarely separated in absolute values to be of use in diagnostic keys.

Eight species have been described previously, as placed in the genus *Dinematchthys*, of which five are here regarded as valid, and represent the three genera dealt with in this part of the review. Three previously described species are placed in synonymy. *Dinematchthys* Bleeker is the earliest named genus of its tribe and hence, its definition is essential to achieving nomenclatural stability. The genus was established by monotypy (*D. ihmocoeteoides*) based on a single type specimen, which according to extensive research by Cohen and Nielsen (1978) must be regarded as no longer extant. For the purpose of redefinition of the genus and species, another original Bleeker specimen mentioned by Günther (1862) (BMNH 1868.2.28.65), probably the oldest extant, is here selected as neotype. Although shrivelled, it represents a male specimen with all the important diagnostic characters, and is in good accordance with Bleeker’s original description except for a slight variation in eye size, which is within the range of variability observed in the species.

MATERIAL AND METHODS

The examination of ca. 6500 specimens of Indo-west Pacific Dinematchthyini yielded 4719 specimens which were identified in the genera treated herein. Also included are additional specimens identified in the collections of AMS and USNM but not borrowed for detailed investigations. These are listed as additional specimens and are not referred to as type specimens for any of the new species.

The material described herein belongs to the following institutions: AMS (Australian Museum, Sydney), ANSP (Academy of Natural Sciences, Philadelphia), BMNH (Natural History Museum, London), BPBM (Bishop Museum, Honolulu), CAS (California Academy of Sciences, San Francisco), KAUM (The Kagoshima University Museum), KSHS (Kochi Prefectural Kochi Nishi Senior High School, Kamobe, Kochi, Japan), MNHN (Muséum National d’Histoire Naturelle, Paris), NSMT (National Science Museum, Tokyo), NTM (Museum and Art Gallery of the Northern Territory (formerly Northern Territory Museum), Darwin), ROM (Royal Ontario Museum, Toronto), SAIAB (South African Institute for Aquatic Biodiversity, formerly RUSI (JLB Smith Institute of Ichthyology), Grahamstown), SMF (Senckenberg Forschungsinstitut und Museum, Frankfurt/Main), SMNS

(Staatliches Museum für Naturkunde, Stuttgart), TAU (Tel Aviv University, Tel Aviv, Israel); USNM (National Museum of Natural History, Smithsonian Institution, Washington D.C.), WAM (Western Australian Museum, Perth), YCM (Yokosuka City Museum), and ZMUC (Zoological Museum, University of Copenhagen).

For methodology used in analysing dinematichthyine fishes, reference is made to Møller *et al.* (2004a) and Schwarzhans *et al.* (2005). Abbreviations used in meristic counts are: D/V = anterior dorsal fin ray above vertebra number; D/A = anterior anal fin ray below dorsal fin ray number; V/A = anterior anal fin ray below vertebrae number; D-A = number of dorsal fin rays minus number of anal fin rays; V in D = number of dorsal fin rays per ray-bearing vertebra. The abbreviations 'i.p.' and 'o.p.' used in the figures relating to male copulatory organ structures are explained in Schwarzhans *et al.* (2005).

The ecology of most of the species is poorly known. From available station data we have gathered some information about habitat and depth range, but we have very little data about behaviour, live colouration and feeding. A number of females were examined for reproductive data, e.g. number and size of embryos.

The distribution maps were created using Microsoft Encarta 2001 digital world atlas.

COMPARATIVE MATERIAL

Indo-west Pacific Dinematichthyini: see Schwarzhans *et al.* (2005), Møller and Schwarzhans (2006) and Schwarzhans and Møller (2007).

American Dinematichthyini: see Møller *et al.* (2004a) and Møller *et al.* (2005).

Brosomphycinae and Bythitinae: see Møller *et al.* (2004b).

SYSTEMATICS

Family Bythitidae Gill, 1861

Subfamily Brosomphycinae Gill, 1862

Tribe Dinematichthyini Cohen and Nielsen, 1978

Diagnosis. Male copulatory organ with penis and 1–2 (rarely 3) pairs of pseudoclaspers in cavity of ventral body wall covered by fleshy hood. First anal fin pterygiophore slightly to strongly elongate. Head pore system generally not reduced, 6 mandibular, 2–4 preopercular, 5–7 infraorbital and 3–4 supraorbital pores, including supraorbital pore above opercular spine. Posteriormost supraorbital head-pore tubular.

Table 1 summarises meristic characters used in distinguishing the species of the genera described here.

Key to the genera and the species reviewed herein

The following key to the genera *Dinematichthys*, *Alionematichthys* gen. nov. and *Porocephalichthys* gen. nov. is based on the key to the genera of the Dinematichthyini,

and on the species reviewed by Schwarzhans and Møller (2007). The first dichotomy in that key refers to the anterior nostril position and immediately separates the three genera dealt with herein from all other dinematichthyine genera. Since, however, certain other dinematichthyine genera exist with almost similarly high anterior nostrils we begin the following key with a separation from those few genera.

- 1a. Anterior nostril positioned high (equal or less than 1/3 the distance from upper lip to anterior margin of eye) 2
- 1b. Anterior nostril positioned low (1/4 to 1/6 the distance from upper lip to anterior margin of eye) all other Dinematichthyini (see Schwarzhans and Møller (2007))
- 2a. Single pair of (outer) pseudoclaspers *Lapitaichthys*
- 2b. Pair of inner and outer pseudoclaspers 3
- 3a. Sulcus of otolith with undivided colliculi *Diancistrus*
[note: only a few species of the genus exhibit an elevated anterior nostril]
- 3b. Sulcus of otolith with separated colliculi (not known for *Alionematichthys samoensis*) 4
- 4a. Inner pseudoclasper stalked with sucker-disk shaped tip *Eusmencilus pistillum*
[note: the only species in *Eusmencilus* with an elevated anterior nostril]
- 4b. Inner pseudoclasper variable, flap or stick-shaped or folded, but not stalked and without sucker-disk shaped tip 5
- 5a. Head with continuous squamation on cheeks, opercle and occiput 6
[note: juveniles of *Dinematichthys* may have a scaleless gap between cheeks and opercle]
- 5b. Head with scales on cheeks and in some species with scale patch on opercle above opercular spine, rarely also below opercular spine (*Alionematichthys*) 8
- 6a. Upper preopercular pore present, a pair of additional mandibular pores, three additional pairs of pores on occiput, one behind eye, two above preopercular pore; sulcus of otolith with nearly equally long ostium and cauda; precaudal vertebrae 14, total vertebrae 47–49, dorsal fin rays 96–104, D/A 37–43; canine teeth absent *Porocephalichthys dasyrhynchus*
- 6b. Upper preopercular pore absent (see Schwarzhans *et al.* 2005, fig. 1A), no additional mandibular pores, no pores on occiput; sulcus of otolith with ostium at least two times as long as cauda; precaudal vertebrae 11–12, total vertebrae 41–45, dorsal fin rays 75–92, D/A < 30; canine teeth present (*Dinematichthys*)... 7

- 7a. Inner pseudoclasper with 2 lobes; head squamation not extending beyond tip of maxilla *Dinematichthys ihuocoetoides*
- 7b. Inner pseudoclasper with 3 lobes; head squamation extending beyond tip of maxilla forward of 3rd posterior mandibular pore *Dinematichthys trilobatus* sp. nov.
- 8a. Upper preopercular pore present on both head sides; cirri on snout present or absent 9
- 8b. Upper preopercular pore absent (rarely present on one head side only); cirri on snout absent 15
- 9a. Cirri on snout absent, eye small (usually < 2% SL) 10
- 9b. Cirri on snout present (except absent in *Alionematichthys suhensis* sp. nov.), eye relatively large (usually > 2% SL) 11
- 10a. Scales above opercular spine 3–10; inner pseudoclasper with anterior thorn as long as posterior lobe; otolith length to otolith height 1.8–2.0, sulcus without ventral indentation at junction of ostium and cauda *Alionematichthys crassiceps* sp. nov.
- 10b. Scales above opercular spine absent; inner pseudoclasper with anterior thorn shorter than posterior lobe; otolith length to otolith height 2.2–2.3, sulcus with ventral indentation at junction of ostium and cauda *Alionematichthys minyonma*
- 11a. Scales above opercular spine 5–17; pseudoclaspers not extruding beyond hood in resting position 12
[note: scales 2–6 in few tentatively assigned specimens – *Alionematichthys* aff. *riukiensis*]
- 11b. Scales above opercular spine 0–2; pseudoclaspers usually extruding beyond hood in resting position 13
- 12a. Inner pseudoclasper thick, large, anterior thorn entirely fused to anterior rim of outer pseudoclasper; scale patch on opercle below opercular spine in large specimens *Alionematichthys riukiensis*
- 12b. Inner pseudoclasper thin, small, bifurcate, anterior thorn free from outer pseudoclasper; no scale patch on opercle below opercular spine *Alionematichthys winterbottomi* sp. nov.
- 13a. Cirri on snout absent; anterior thorn of inner pseudoclasper very long, twice as long as posterior lobe *Alionematichthys suhensis* sp. nov.
- 13b. Cirri on snout present; anterior thorn of inner pseudoclasper about as long as posterior lobe 14
- 14a. Outer pseudoclasper with thick knob on inner face distally; posterior nostril funnel-shaped *Alionematichthys samoensis* sp. nov.
- 14b. Outer pseudoclasper thin, without knob; posterior nostril with anterior flap, not funnel-shaped *Alionematichthys piger*
- 15a. Scales above opercular spine 2; sulcus of otolith with extremely small cauda (ostium length to cauda length 5.5–7, ostium height to cauda height 2.2–2.7) *Alionematichthys shinoharai* sp. nov.
- 15b. Scales above opercular spine absent; sulcus of otolith with moderately small cauda (ostium length to cauda length 3–4, ostium height to cauda height 1.5–2.0) 16
- 16a. Inner pseudoclasper thick, with posterior lobe folded over anterior thorn; outer pseudoclasper with thickened tip *Alionematichthys plicatosurenhis* sp. nov.
- 16b. Inner pseudoclasper thin, unfolded; outer pseudoclasper with thin or with knob on inner face 17
- 17a. Inner pseudoclasper with a symmetrically developed anterior thorn and posterior lobe resembling in shape a socket fitting to a small knob on the inner face of the outer pseudoclasper; snout rounded; otolith length to height 2.3–2.4, with shallow dorsal rim *Alionematichthys ceylonensis* sp. nov.
- 17b. Inner pseudoclasper a simple flap without significant indentation; snout pointed; otolith length to height 2.1–2.3, with distinct postdorsal projection *Alionematichthys phuketensis* sp. nov.

Alionematichthys gen. nov.

(Tables 1–12)

Type species: *Dinematichthys riukiensis* Aoyagi, 1954 (type locality: Ishigaki Island, Ryukyu Islands, Japan). Gender masculine.

Dinematichthys (non Bleeker, 1855) in part. — Alcock 1890: 432; Aoyagi 1954: 237; Cohen and Nielsen 1978: 57; Sedor and Cohen 1987: 6; Machida 1994: 451; Nielsen *et al.* 1999: 129; Møller *et al.* 2004a: 148.

Diagnosis. A genus of *Dinematichthyini* with the following combination of characters: anterior nostril placed high on snout at about one-third or less the distance from lip to anterior rim of eye; head with a scale patch on cheeks, in some species also above opercular spine, rarely below opercular spine; male copulatory organ with two pairs of mostly small pseudoclaspers, the outer up to twice as large as inner; inner pseudoclasper with anteriorly oriented pointed lobe containing supporter and fleshy appendix posteriorly; large size, up to 150 mm SL; precaudal vertebrae 10–12, total vertebrae 39–45, dorsal fin rays 71–92, anal fin rays 55–72, V in D 2.0–2.4; upper preopercular pore present or, less commonly, absent; sulcus of otolith with ostium at least twice as long as cauda; maxilla expanded posteroventrally.

Table 1. Selected meristic characters of the species of *Alionematichthys*, *Dinematichthys* and *Porocephalichthys*: A, frequency distribution of precaudal vertebrae, total vertebrae and anal fin ray counts; B, frequency distribution of dorsal fin ray and pectoral fin rays counts.

A	precaudal vertebrae					total vertebrae										anal fin rays																		
	10	11	12	13	14	39	40	41	42	43	44	45	46	47	48	49	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
<i>Alionematichthys ceylonensis</i>		2	64					8	51	7									1	4	12	16	22	5	4	-	2							
<i>Alionematichthys crassiceps</i>	1	41					4	30	8										1	7	2	5	10	9	6	1								
<i>Alionematichthys minyonma</i>	4	15				3	16										1	1	6	6	3	1	1											
<i>Alionematichthys phuketensis</i>			9						2	7												1	1	2	1	2	2							
<i>Alionematichthys piger</i>		309	25				5	42	206	73	9	2					2	-	5	10	23	41	57	51	46	38	19	8	2	-	1	1		
<i>Alionematichthys plicatosurcubus</i>		1	27						2	21	4	1										1	8	6	3	3	6	-	1					
<i>Alionematichthys riukiuensis</i>		80	41					1	39	62	18										2	3	5	14	16	6	14	12	10	13	4	4	2	2
<i>Alionematichthys samoensis</i>		25	8				1	2	29	1									3	8	10	3	5	2	1	1								
<i>Alionematichthys shinoharai</i>		2								1	1																	2						
<i>Alionematichthys subnensis</i>		15	14					1	24	4							1	2	3	4	3	7	6	2	1									
<i>Alionematichthys winterbottomi</i>		25	1				1	3	17	5												1	3	6	1	13								
<i>Alionematichthys</i> sp. 1			2						1	1														1	1									
<i>Alionematichthys</i> sp. 2		1						1											1															
<i>Dinematichthys ihocoeteoides</i>	2	147	5					12	73	46	14	8									1	3	6	9	14	21	23	23	14	10	9	5	1	
<i>Dinematichthys trilobatus</i>		15							5	10												1	2	1	1	2	3	4	1					
<i>Porocephalichthys dasyrhynchus</i>				9										2	4	3								1			1	3		3	1			

B	dorsal fin rays																	pectoral fin rays																											
	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	19	20	21	22	23	24	25	26	27	28	
<i>Alionematichthys ceylonensis</i>					4	-	10	15	15	9	8	3	2																							1	4	5	4						
<i>Alionematichthys crassiceps</i>		1	4	7	5	8	5	5	1	4	1																										2	1	4	2					
<i>Alionematichthys minyonma</i>	1	-	1	9	2	5	-	-	1																													5	7	1					
<i>Alionematichthys phuketensis</i>											2	2	3	-	-	1	-	-	1																			2	4	1					
<i>Alionematichthys piger</i>		1	-	2	9	21	28	34	50	42	41	18	7	6	1	1	1	1																				2	1	5	1				
<i>Alionematichthys plicatosurcubus</i>						1	2	1	4	4	8	5	2	1																									1	7	3				
<i>Alionematichthys riukiuensis</i>							1	3	7	4	12	8	13	16	10	12	4	7	7	2	-	1																	5	-	3	2	1		
<i>Alionematichthys samoensis</i>			2	3	5	6	7	3	4	3																													1	3	8				
<i>Alionematichthys shinoharai</i>												1	-	1																									2						
<i>Alionematichthys subnensis</i>		1	-	1	2	3	8	5	2	5	1	1																										3	5	3	1				
<i>Alionematichthys winterbottomi</i>										2	7	4	2	6	2	1																							2	4	5				
<i>Alionematichthys</i> sp. 1													1	-	-	1																							1	-	1				
<i>Alionematichthys</i> sp. 2					1																																		1						
<i>Dinematichthys ihocoeteoides</i>					1	-	1	5	5	10	15	23	14	24	12	13	6	5	-	1	1	1																	2	3	8	2			
<i>Dinematichthys trilobatus</i>									5	1	2	1	3	1	-	2																							1	7	5	1			
<i>Porocephalichthys dasyrhynchus</i>																									2	-	2	1	1	1	-	1	1									3	4	3	3

Comparison. *Alionematchthys* is clearly related to *Dinematchthys*, from which it mainly differs by lacking a uniform and continuous head squamation, including the cheeks, opercle and occiput (vs scale patches on the cheeks and, in some species, on the opercle). The head squamation of *Dinematchthys* (and *Porocephalichthys* gen. nov.) is unique within the Dinematchthyini and it supports the stability of generic diagnoses in the tribe. *Dinematchthys* cannot easily be separated from *Alionematchthys* without that character.

Species. *Alionematchthys* comprises 11 species; 10 from the Indo-west Pacific – *A. ceylonensis* sp. nov., *A. crassiceps* sp. nov., *A. phuketensis* sp. nov., *A. piger* (Alcock, 1890) (formerly placed in *Dinematchthys*), *A. plicatosurculus* sp. nov., *A. rinkiensis* (Aoyagi, 1954) (formerly placed in *Dinematchthys* with *Dinematchthys megasoma* Machida, 1994, as a junior synonym), *A. samoensis* sp. nov., *A. shinoharai* sp. nov., *A. suhensis* sp. nov., *A. winterbottomi* n. sp., and one species from the tropical West Atlantic – *A. minyomma* (Sedor and Cohen, 1987) (formerly placed in *Dinematchthys*).

The species of the genus *Alionematchthys* can be arranged in three species groups according to the presence or absence of the upper preopercular pore, the presence or absence of scales on the opercle, differences in the eye size, and the presence or absence of cirri on the snout as follows:

1) *Alionematchthys plicatosurculus* sp. nov. species group: upper preopercular pore absent, no cirri on snout, large eyes and no scales on the opercle, except for *A. shinoharai* sp. nov. (two scales above opercular spine). This group contains four species (*A. ceylonensis* sp. nov., *A. phuketensis* sp. nov., *A. plicatosurculus* sp. nov. and *A. shinoharai* sp. nov.). However, strong differences in the pseudoclasper and otolith morphology of some species indicate that these species may not be closely related.

2) *Alionematchthys rinkiensis* species group: upper preopercular pore present, numerous cirri on snout (except cirri lacking in *A. suhensis* sp. nov.) and large eyes. Presence or absence of scales on the opercle could be used to separate two subgroups, one with five or more scales above the opercular spine (*A. rinkiensis* and *A. winterbottomi* sp. nov.), and the other usually without scales on the opercle (rarely up to two scales above the opercular spine) (*A. piger*, *A. samoensis* sp. nov. and *A. suhensis* sp. nov.).

3) *Alionematchthys minyomma* species group: upper preopercular pore present, no cirri on snout, small eyes and scales on opercle present or absent (*A. crassiceps* sp. nov. and *A. minyomma*). The small eyes and the big head readily distinguish this small group, which combines a western Pacific species and the only Atlantic species of the genus.

Remarks. Some of the more widespread species, namely *A. crassiceps* sp. nov., *A. piger* and *A. rinkiensis*, show a remarkable regionalisation usually based on variations of a single character.

Alionematchthys crassiceps sp. nov. and *A. rinkiensis* contain few specimens, which can only be tentatively assigned to the respective species. In the case of *A. piger* the pseudoclaspers exhibit a wider than usual variation which, however, does not seem to follow regional trends in this particular case. The distinction of these (regional) variations is not sufficient at this stage, but it is possible that future genetic investigations may result in distinguishing more species than we currently recognise.

Etymology. Combined from *alius* (Latin = the other, different) and *nematchthys*, the stem of the genus name *Dinematchthys*, to which *Alionematchthys* is most similar. The gender is masculine.

Alionematchthys ceylonensis sp. nov.

(Figs 1–3; Tables 1, 2)

Material examined. (84 specimens, 19–72 mm SL). HOLOTYPE – USNM 263707, male, 59 mm SL, Sri Lanka, Weligama, 500 yards south of rest house, 05°57'25"N, 80°26'12"E, 5–6 m, C. Koenig, 15 Feb. 1970. PARATYPES – USNM 263731, 4 males, 42–65 mm SL, 6 females, 47–63 mm SL, Sri Lanka, Weligama; USNM 366532, 4 specimens, 37–72 mm SL, 08°33'24"N, 81°14'42"E, Trincomalee, Sri Lanka, 2–5 m, T. Iwamoto, 25 Sept. 2001; USNM 394975, 25 males, 37–69 mm SL and 40 females, 37–60 mm SL, same data as holotype.

Additional material. USNM 366531, 7 specimens, 25–65 mm SL, Sri Lanka, Trincomalee; USNM 366533, 4 specimens, 40–59 mm SL, Sri Lanka, Batticaloa; USNM 366534, 6 specimens, 34–60 mm SL, 07°56'N, 81°34'E, Sri Lanka.

Diagnosis. Vertebrae 11–12+29–31=41–43, dorsal fin rays 75–83 (average 79), anal fin rays 57–65 (average 60); eyes moderately large (2.0–2.8% SL); snout rounded, without cirri; scales only on cheeks; no upper preopercular pore; outer pseudoclasper broad-based, triangular, with distal knob on inner side; inner pseudoclasper with symmetrically developed anterior pointed lobe and posterior lobe resembling in shape a socket fitting to small knob on inner face of outer pseudoclasper; otolith length to height 2.3–2.4, with shallow dorsal rim, otolith length to sulcus length 1.5–1.6, ostium length to cauda length 3.3–4.0.

Description (Figs 2–3). The principal meristic and morphometric characters are shown in Table 2. Mature at about 45 mm SL. Body slender, with rounded head profile. No cirri on snout. Eye size 2.0–2.8 (2.6%) SL. Head with scale patch on cheek containing 6–8 (8) vertical rows of scales on upper part and 3 vertical rows on lower part. Horizontal diameter of scales on body about 1.5% SL, in 29 horizontal rows. Maxillary ending far behind eye, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end expanded, with small knob. Anterior nostril positioned high, 1/2.5 distance from upper lip to anterior margin of eye. Posterior nostril small, about one-fifth the size of eye. Opercular spine with free tip, thin and



Fig. 1. Sample sites of ● *Alionematichthys ceylonensis* sp. nov., ● *A. phuketensis* sp. nov., ⊗ *A. shinoharai* sp. nov., ⊕ *A. plicatosurculus* sp. nov., ○ *A. crassiceps* sp. nov., and ○ *A. aff. crassiceps*. One symbol may represent several samples.



Fig. 2. *Alionematichthys ceylonensis* sp. nov., USNM 263707, holotype, male, 59 mm SL.

sharply pointed. Anterior gill arch with 14–18 (17) rakers, 3 elongate. A single short raker is placed between the two lower elongate rakers in holotype and several paratypes. Pseudobranchial filaments 2.

Head sensory pores (Fig. 3A, B). Supraorbital pores 2 to 3: first pore in front of second anterior infraorbital pore, second pore above and behind eye usually absent, third pore tubular, at upper termination of gill opening above opercular spine. Infraorbital pores 6 (3 anterior and 3 posterior): first anterior pore behind anterior nostril, second and third anterior pores covered by dermal flap of upper lip, three posterior pores on rear part of upper lip, about 1/3 the size of three anterior pores. Mandibular pores 6 (3 anterior and 3 posterior): first anterior pore large and tubular, second anterior pore positioned in lateral skin fold,

small, third anterior pore at anterior termination of jugular isthmus, three posterior pores on rear part of lower jaw. Preopercular pores: 3 lower, first and second with joined opening, covered by dermal flap in lateral view; third non-tubular; no upper preopercular pore. [This description of the position of head sensory pores is used as reference for all subsequent descriptions.]

Dentition (of holotype). Premaxilla with 6 outer rows of granular teeth and 1 inner row of larger teeth anteriorly. Anteriormost teeth in inner row up to 1/4 diameter of pupil. Vomer horseshoe-shaped, with 3 outer rows of small teeth and 1 inner row of large teeth up to 1/5 diameter of pupil. Palatine with 3 outer rows of small teeth and 1 inner row of long teeth up to 1/4 diameter of pupil. Dentary with 5

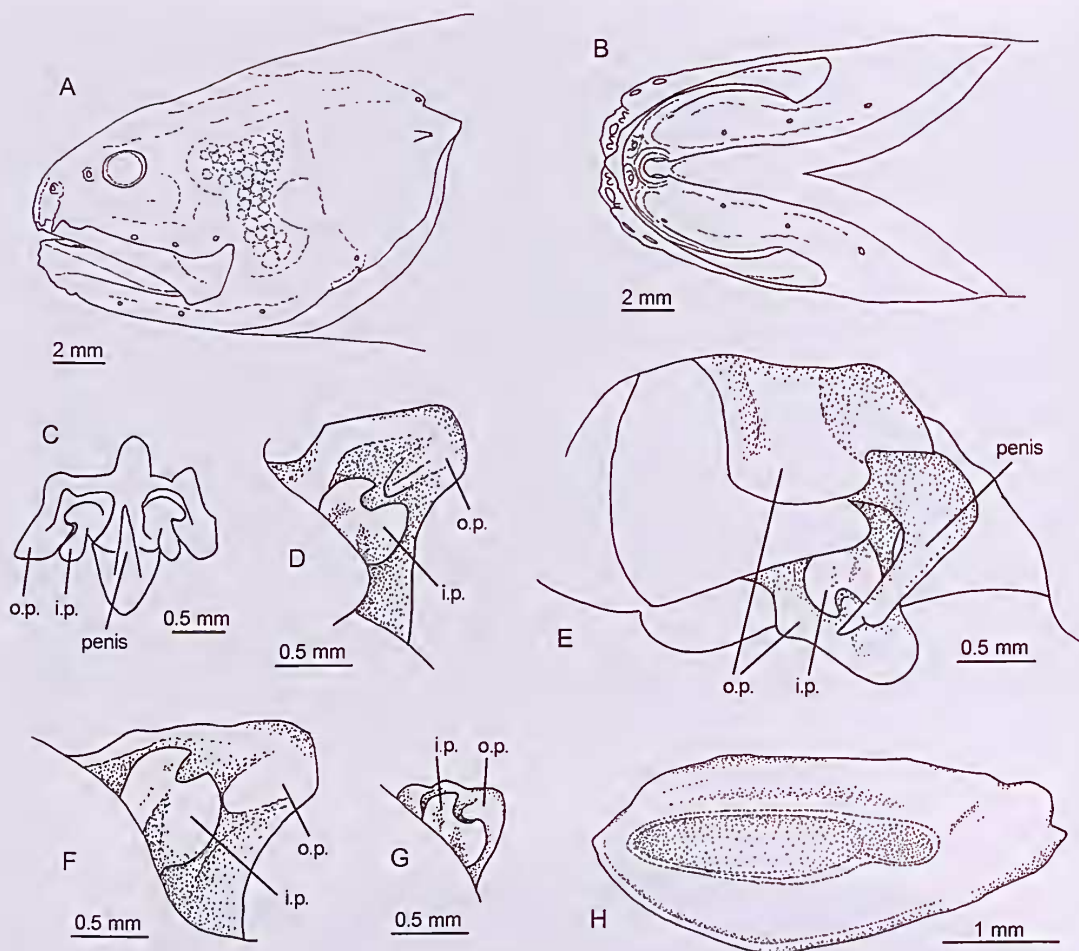


Fig. 3. *Alionemachthys ceylonensis* sp. nov. A, lateral view of head, holotype; B, ventral view of head, holotype; C, ventral view of male copulatory organ, holotype; D, view of left pseudoclaspers from inside, holotype; E, inclined lateral view of male copulatory organ, holotype; F, view of left pseudoclaspers from inside, USNM 394975, 68 mm SL; G, view of left pseudoclaspers from inside, USNM 394975, 48 mm SL; H, median view of right otolith, USNM 394975, male, 58 mm SL.

outer rows of granular teeth and 1 inner row of larger teeth anteriorly, up to about 1/3 diameter of pupil.

Otolith (Fig. 3H). Elongate in shape, length to height 2.3–2.4 (40–70 mm SL) and thin (otolith height to otolith thickness about 2.5). Anterior and posterior tips moderately pointed, the latter expanded and irregularly ornamented. Dorsal rim shallow; ventral rim likewise shallow, deepest anterior to middle. Inner face moderately convex, outer face slightly concave, both smooth. Otolith length to sulcus length 1.5–1.6. Sulcus slightly supramedially positioned, not inclined, with separated colliculi and marked notch at ventral rim of sulcus at joint of ostium with cauda. Ostium length to cauda length 3.3–4.0. Ventral furrow distinct, very close to ventral rim of otolith.

Axial skeleton. Neural spine of vertebra 4 inclined and 5–8 depressed. Parapophyses present from vertebrae 6 to 12 (11). Pleural ribs on vertebrae 2 to 11 (10). First anal fin

pterygiophore not or only slightly longer than subsequent pterygiophore.

Male copulatory organ (Fig. 3C–G). Two pairs of moderately large pseudoclaspers, outer pair about 50% larger than inner; outer pseudoclasper with broad base, triangular with pointed tip and distinct knob at inner face near tip; inner pseudoclasper with symmetrically developed anterior thorn and posterior lobe resembling in shape a socket fitting to small knob on the inner face of the outer pseudoclasper. Isthmus narrow; penis curved, about as long as outer pseudoclaspers.

Colour. Live colour unknown. Preserved colour uniformly dark brown.

Comparison. *Alionemachthys ceylonensis* belongs to the species group without an upper preopercular pore together with *A. phuketensis* sp. nov., *A. plicatosurculus* sp. nov. and *A. shinoharai* sp. nov., from which it differs in the peculiar shape of the inner pseudoclasper and the

Table 2. Meristic and morphometric characters of *Alionematichthys ceylonensis* sp. nov.

	Holotype USNM- 263707	Holotype + 83 paratypes	n
	Mean (range)		
Standard length in mm	59	53.9 (19-72)	84
Meristic characters			
Dorsal fin rays	79	78.9 (75-83)	66
Caudal fin rays	15	15.9 (15-17)	40
Anal fin rays	61	60.5 (57-65)	66
Pectoral fin rays	19	20.9 (19-22)	14
Precaudal vertebrae	12	12.0 (11-12)	66
Caudal vertebrae	29	30.0 (29-31)	66
Total vertebrae	41	42.0 (41-43)	66
Rakers on anterior gill arch	17	16.6 (14-18)	13
Pseudobranchial filaments	-	2	13
D/V	6	5.8 (5-6)	66
D/A	21	22.6 (20-26)	66
V/A	13	13.3 (13-15)	66
Morphometric characters in % of SL			
Head length	27.8	26.8 (25.8-27.8)	11
Head width	15.3	14.1 (12.1-16.1)	11
Head height	16.0	16.4 (14.8-17.9)	11
Snout length	5.5	6.0 (5.4-6.8)	11
Upper jaw length	14.8	11.8-15.1 (14.0)	11
Diameter of pigmented eye	2.6	2.5 (2.0-2.8)	11
Diameter of pupil	1.1	1.5 (1.1-1.7)	11
Interorbital width	7.8	7.3 (6.3-8.0)	11
Posterior maxilla height	4.7	4.4 (3.4-4.9)	11
Postorbital length	19.9	19.4 (18.5-20.7)	11
Preal length	47.9	47.5 (45.8-51.7)	11
Predorsal length	32.4	31.0 (30.0-32.5)	11
Body depth at origin of anal fin	18.7	18.3 (14.5-20.1)	11
Pectoral fin length	12.6	12.6 (11.7-13.2)	11
Pectoral fin base height	6.5	6.2 (5.2-7.2)	11
Ventral fin length	23.3	22.7 (19.2-24.5)	12
Base ventral fin - anal fin origin	28.3	28.3 (26.7-32.8)	11

knob at the inner face of the outer pseudoclasper and the slender otoliths (otolith length to otolith height 2.3–2.4 vs 2.1–2.3). From *A. phuketensis* sp. nov., it differs further in the rounded snout profile (vs pointed) and the lack of a distinct postdorsal projection of the otolith. From *A. shinoharai* sp. nov., it further differs in the lack of scales above the opercular spine (vs 2), the long suleus (otolith length to sulcus length 1.5–1.6 vs 1.9–2.0) and the notch at the ventral suleus margin at the joint of ostium and cauda (vs no notch).

Distribution. *Alionematichthys ceylonensis* occurs only along the shores of the island of Sri Lanka (Fig. 1).

Biology. A 53 mm SL gravid female (USNM 394975) contains 80 embryos, length 4.8 mm TL, and 60 orange eggs, diameter 0.7 mm.

Etymology. Named after the type locality, Sri Lanka, previously known as Ceylon. It is an adjective.

Alionematichthys crassiceps sp. nov.

(Figs 1, 4–6; Tables 1, 3)

Material examined. 53 specimens, 34–63 mm SL. HOLOTYPE – BPBM 9310, male, 63 mm SL, Truk, Caroline Islands, Southfield beach, 08°0'N, 147°0'E, inshore, 0–4 m, rock and Halimeda algae, J. E. Randall, 10 July 1969. PARATYPES – BPBM 9217, 1 male, 40 mm SL, 1 female, 42 mm SL, Palau Islands, NE Arakabesan Island, 0.5–1 m, corals, J. E. Randall and E. S. Helfman, 5 June 1968; BPBM 40932, 3 females, 46, 46 and 47 mm SL, 3 males, 34, 36, 43 mm SL, same data as for holotype; AMS 1. 20547-042, 1 male, 40 mm SL, 2 females, 45 and 48 mm SL, Panasesa reef, Louisiade Archipelago, Papua New Guinea, 5–8 m, B. Goldman, 24 March 1969; CAS 227282, 1 male, 49 mm SL, 1°4'28"N, 154°42'28"E, 0–15 m, lagoon coral heads on inner margin of reef flat at Tewawaclal, extreme W end of atoll; low tide; water clear, sand & coral, Kapingamarangi Atoll, Pohnpei, Caroline Islands, Micronesia, Atta, Kindaro and H. H. Rofen, 14 July 1954; CAS 222543, 2 males, 50 and 52 mm SL, Vanua Levu, Fiji; CAS 222563, 2 males, 40 and 47 mm SL, 1 female, 37 mm SL, Suva, Fiji; CAS 227285, 1 female, 52 mm SL, Vanua Levu, Fiji; CAS 227303, 1 female, 30 mm SL, 1 male, 40 mm SL, Suva, Fiji; USNM 223247, 1 male, 55 mm SL, 07°00'30"N, 158°11'55"E, Caroline Islands, Pohnpei, off east side of Jokaj Passage, 0–4 m, V. G. Springer and party, 5 Sept. 1980; USNM 394976, 3 females, 42, 43 and 56 mm SL, 4 males 40–57 mm SL, 2 juveniles 12 and 22 mm SL, 18°44'S, 174°06'W, Vava'u Islands, Tonga, 0–11 m, J.T. Williams *et al.*, 17 Nov. 1993; USNM 352743, 7 males, 48–60 mm SL, 5 females, 47–67 mm SL, 18°44'25"S, 169°12'41"E, Vanuatu, Erromango, Port Narevin, 0–5 m, J. T. Williams *et al.*, 28 May 1996; USNM 374196, 1 male, 57 mm SL, 01°31'12"S, 145°01'30"E, Papua New Guinea, Hermit Islands, Jalun Island, V. G. Springer and party, 1 Nov. 1978.

Tentatively assigned specimens. USNM 366687, 3 males, 47, 50 and 53 mm SL, Bay SE of K'en Ting, Taiwan, 0–3 m, V. G. Springer and party, 22 April 1968.

Additional material. USNM 334123, 1 male, 49 mm SL, Tonga; USNM 374210, 1 male, 45 mm SL, 4 females, 34–50 mm SL, Tongatapu, Tonga.

Diagnosis. Vertebrae 10–11+29–31=40–42, dorsal fin rays 72–81, anal fin rays 57–64; eyes small (1.3–2.5% SL); snout blunt, without cirri; scales on cheeks and patch above opercular spine with 3–10 scales; upper preopercular pore present; outer pseudoclasper broad-based, simple flap like; inner pseudoclasper with free, forward-pointing anterior lobe and broad posterior lobe; otolith length to height 1.9–2.0, with rounded dorsal rim, otolith length to suleus length 1.7–1.8, cauda very short, ostium length to cauda length 4.5–5.0.



Fig. 4. *Alionematischthys crassiceps* sp. nov., BPBM 9310, holotype, male, 63 mm SL.

Description (Figs 4–6). The principal meristic and morphometric characters are shown in Table 3. Mature at about 45 mm SL. Body stout, with rounded, robust head profile (interorbital width 6.6–8.9 (7.4)% SL). No cirri on snout. Eye size 1.3–2.5 (1.3)% SL. Head with scale patch on cheek containing 6–10 (10) vertical rows of scales on upper part and 3–5 vertical rows on lower part. Horizontal diameter of scales on body of holotype 2.1% SL, in about 26 horizontal rows. Maxillary ending far behind eye, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end strongly expanded. Anterior nostril positioned high, one-third distance from upper lip to anterior margin of eye. Posterior nostril small, about one-sixth the size of eye or less. Opercular spine with free tip, pointed. Anterior gill arch with 16–19 (16) rakers, 3 elongate. Pseudobranchial filaments 1–2 (1).

Head sensory pores (Figs 5A–E, 6A,B). Supraorbital pores 2 to 3. Infraorbital pores 6 (3 anterior and 3 posterior), posterior pores about one-third the size of anterior pores. Mandibular pores 6 (3 anterior and 3 posterior): first anterior pore large, tubular, with cirrus. Preopercular pores: 3 lower, first and second with joined opening, covered by dermal flap in lateral view; third nontubular; small upper preopercular pore. [See description of *Alionematischthys ceylonensis* for position of pores.]

Dentition (of holotype). Premaxilla with 6 outer rows of granular teeth and 1 inner row of larger teeth anteriorly. Anteriormost teeth in inner row up to 3/4 diameter of pupil. Vomer horseshoe-shaped, with 4 outer rows of small teeth and 1 inner row of large teeth up to 1/2 diameter of pupil. Palatine with 4 rows of equally long teeth up to 1/2 diameter of pupil. Dentary with 2 outer rows of granular teeth and 2 inner rows of larger teeth anteriorly, up to about size of diameter of pupil.

Otolith (Figs 5M–P, 6E). Compact in shape, length to height 1.9–2.0, moderately thin (otolith height to otolith thickness about 2.5). Anterior tips moderately pointed, posterior tip much expanded postero-dorsally. Dorsal rim evenly curved; ventral rim deep, deepest at its middle or slightly anteriorly. Inner face moderately convex, outer face flat, both smooth. Otolith length to sulcus length 1.7–1.8. Suleus medianly positioned, not inclined, with separated colliculi but no notch at ventral rim of sulcus at joint of

ostium with cauda. Cauda very small, ostium length to cauda length 4.5–5.0. Ventral furrow distinct, very close to ventral rim of otolith.

Axial skeleton. Neural spine of vertebra 4 inclined and 5–8 depressed. Parapophyses present from vertebrae 6 to 11 (10). Pleural ribs on vertebrae 2 to 10 (9). First anal fin pterygiophore not or only slightly longer than subsequent pterygiophore.

Male copulatory organ (Figs 5F–L, 6C, D). Two pairs of moderately large pseudoclasps, outer pair about 50% larger than inner; outer pseudoclasps with widened base and rounded tip, flat, flap-like; inner pseudoclasps with free, forward-pointing anterior thorn, connected at base to anterior rim of outer pseudoclasps and broad posterior lobe with deep inclined furrow on its inner margin. Isthmus moderately wide; penis curved, somewhat longer than outer pseudoclasps.

Colour. Live colour unknown. Preserved colour uniformly light brown.

Remarks. *Alionematischthys crassiceps* shows a high degree of regional differentiation.

Specimens from Vanuatu (Fig. 5C) and Fiji have a generally higher number of scales (7–10) above the opercular spine than those from Tonga (Fig. 5D) or Micronesia (Fig. 5A, B) (5–7) on either side of the distribution range. Those from Tonga show a peculiar pattern in the way that 3–4 larger scales form a straight row with 2–3 small scales above (Fig. 5D). The ones from western Micronesia (Truk and Palau) (Fig. 5A–B) have the highest number of vertical scale rows on the cheeks (mostly 8 vs 6–7). Those from Pohnpei and Kapingamarangi Atoll (Fig. 5E) appear to have slightly larger eyes than those from other locations. All these differences, however, are very subtle and are not supported by other characters so as to warrant a separation into different species.

Three specimens from Taiwan (Fig. 6A–E) are tentatively placed in the species (*A. aff. crassiceps*) due to some folded, cirri-like dermal flaps on the chin, a generally lower number of scales above the opercular spine (3–6), a rather short anterior thorn of the inner pseudoclasps and its remote location from the other specimens of the species.

Comparison. *Alionematischthys crassiceps* is readily recognised by its big head and the small eyes, both characters

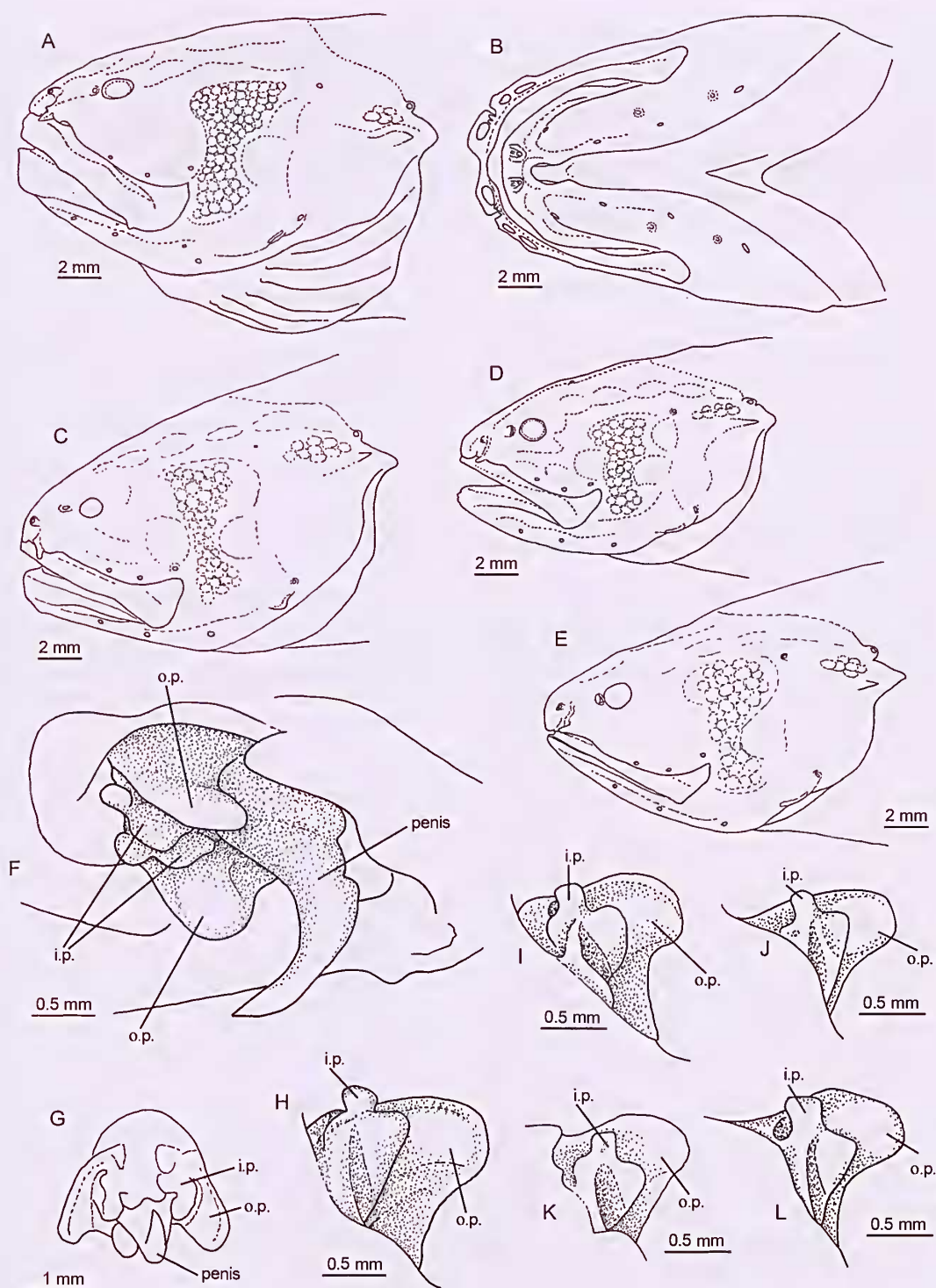


Fig. 5 (part). *Alionematischthys crassiceps* sp. nov., A, lateral view of head, holotype; B, ventral view of head, holotype; C, lateral view of head, holotype; D, lateral view of head, USNM 394976, male, 49 mm SL; E, lateral view of head, USNM 223247, male, 55 mm SL; F, inclined lateral view of male copulatory organ, holotype; G, ventral view of male copulatory organ, USNM 374196, 58 mm SL; H, view of left pseudoelaspers from inside, holotype; I, view of left pseudoelaspers from inside, USNM 394976, male, 49 mm SL; J, view of left pseudoelaspers from inside, USNM 394976, 57 mm SL; K, view of left pseudoelaspers from inside, CAS 222543, 50 mm SL; L, view of left pseudoelaspers from inside, USNM 223247, 55 mm SL.

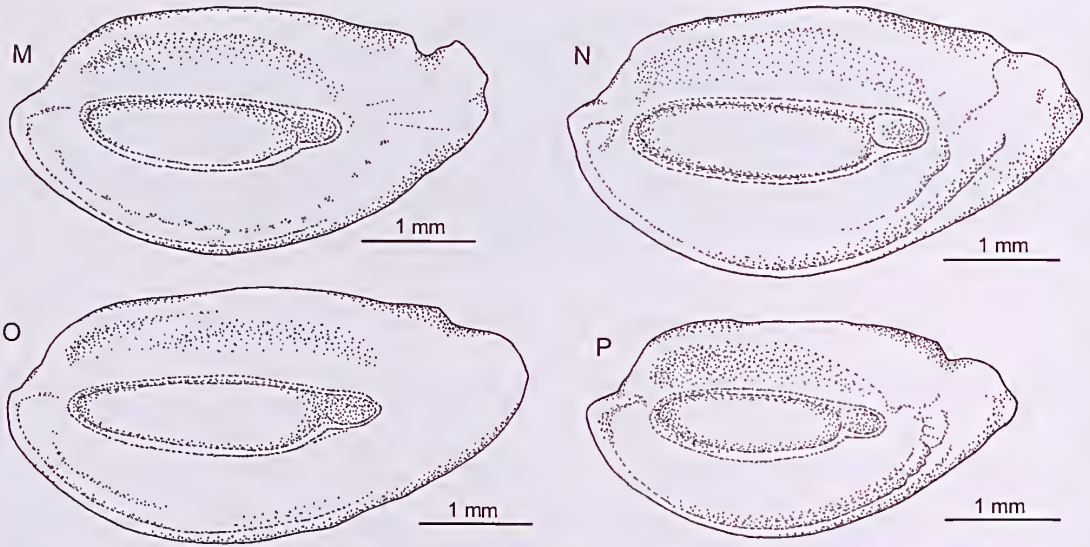


Fig. 5 (continued). M, median view of right otolith, CAS 222543, male, 50 mm SL; N, median view of right otolith, USNM 352743, female, 67 mm; O, median view of right otolith, USNM 374196, male, 58 mm SL; P, median view of right otolith, USNM 394976, female, 56 mm SL.

that connects it with the West Atlantic *A. minyomma*, from which it is distinguished by the presence of scales above the opercular spine (vs absent) and the compact otolith with an otolith length to otolith height ratio of 1.9–2.0 (vs 2.2–2.3). The only co-occurring Dinematchthyini with big

heads and small eyes are those of the genus *Diancistrus* Ogilby of the *Diancistrus erythraeus* species group which, however, shows a completely different pseudoclasper pattern (see Schwarzhans *et al.* 2005), no scales above the opercular spine and an otolith with an undivided sulcus

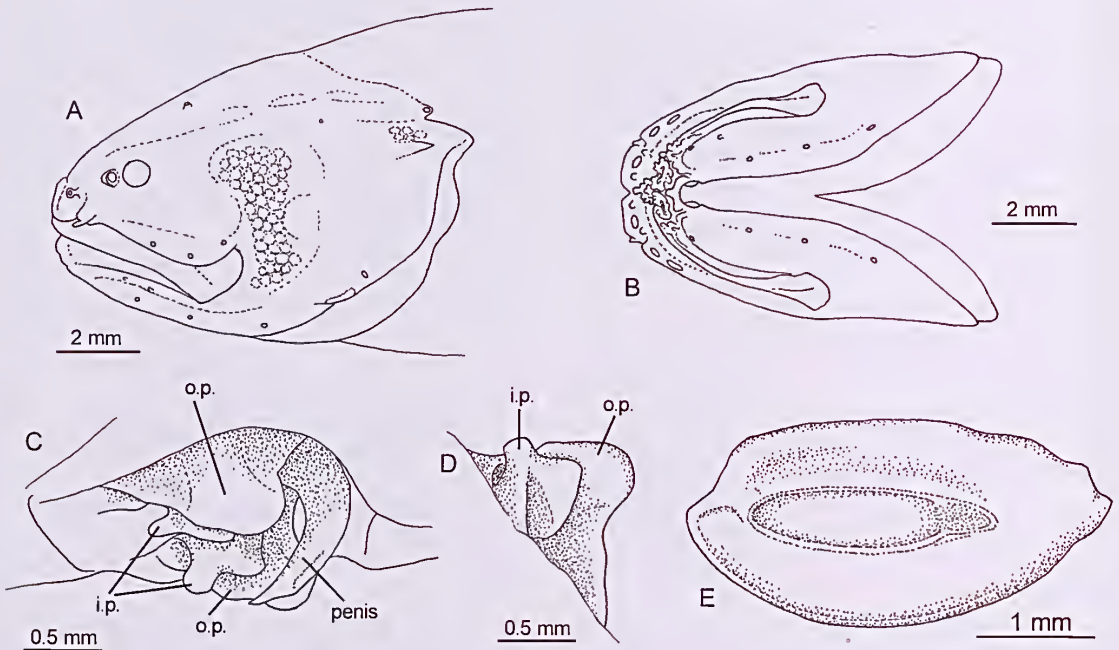


Fig. 6. *Alionematchthys* aff. *crassiceps*, USNM 366687, A, lateral view of head; B, ventral view of head; C, inclined lateral view of male copulatory organ; D, view of left pseudoelaspers from inside; E, median view of right otolith.

and fused colliculi. From other eo-occurring species of *Alionematchthys*, it is distinguished by the following additional characters: from *A. piger*, by the small outer pseudoelasper (vs long), the lack of cirri on the snout (vs present) and the presence of scales above the opercular spine (vs absent); from *A. plicatosurculus* sp. nov., by the different pseudoelasper pattern, the presence of an upper preopercular pore (vs absent), the presence of scales above the opercular spine (vs absent); from *A. riukiensis*, through the anteriorly free inner pseudoelasper (vs connected), the compressed otolith (vs elongate) and the lack of cirri on the snout (vs present); and from *A. winterbottomi* sp. nov., in the shape of the inner pseudoelasper and the lack of cirri on the snout (vs present).

Distribution. *Alionematchthys crassiceps* occurs along oceanic islands of the West Pacific from Micronesia (Palau, Chuuk, Pohnpei, Kapingamarangi Atoll), Hermit Island and

the Kiriwina (Trobriand) Islands of New Guinea, Vanuatu, Fiji to Tonga (Fig. 1). There are a few tentative records from Taiwan.

Biology. A 56 mm SL female (USNM 394976) contained 95 embryos, length 4.1 mm TL, and ca. 50 orange eggs, diameter 0.6 mm.

Etymology. Named after the big head characteristic for the species; *crassus* (Latin = thick) and adjective ending derived from *caput* (Latin = head). It is a noun in apposition.

Alionematchthys minyomma (Sedor and Cohen, 1987)

(Figs 7, 8; Tables 1, 4)

Dinematichthys minyomma Sedor and Cohen, 1987: 6; Nielsen *et al.* 1999: 130; Møller *et al.* 2004: 149 (as *D. minyomma*).

Species 2. — Sedor 1985.

Table 3. Meristic and morphometric characters of *Alionematchthys crassiceps* sp. nov.

	Holotype BPBM 9310	Holotype + 42 paratypes Mean (range)	n
Standard length in mm	63	46.6 (12-67)	43
Meristic characters			
Dorsal fin rays	73	76.0 (72-81)	38
Caudal fin rays	16	16	10
Anal fin rays	59	60.7 (57-64)	38
Pectoral fin rays	22	21.7 (20-23)	9
Precaudal vertebrae	11	11.0 (10-11)	39
Caudal vertebrae	30	30.2 (29-31)	39
Total vertebrae	41	41.2 (40-42)	39
Rakers on anterior gill arch	16	17.4 (16-19)	9
Pseudobranchial filaments	1	1.9 (1-2)	8
D/V	6	5.9 (5-7)	39
D/A	20	20.6 (18-23)	39
V/A	13	12.7 (12-13)	39
Morphometric characters in % of SL			
Head length	28.1	30.0 (28.1-34.3)	9
Head width	17.6	15.6 (13.7-18.1)	9
Head height	19.9	18.6 (17.3-20.8)	9
Snout length	7.2	6.7 (5.7-8.0)	9
Upper jaw length	14.7	14.5 (13.6-16.9)	9
Diameter of pigmented eye	1.3	1.9 (1.3-2.5)	9
Diameter of pupil	1.0	1.2 (0.9-1.8)	9
Interorbital width	7.4	7.8 (6.6-8.9)	9
Posterior maxilla height	4.7	4.9 (4.6-5.7)	8
Postorbital length	21.0	22.3 (21.0-26.3)	9
Precanal length	49.1	49.1 (44.0-57.9)	9
Predorsal length	33.1	33.1 (31.6-36.6)	9
Body depth at origin of anal fin	20.6	19.4 (17.9-23.1)	9
Pectoral fin length	15.5	15.5 (12.6-18.8)	9
Pectoral fin base height	6.6	6.7 (6.0-8.2)	9
Ventral fin length	21.8	26.3 (21.8-29.8)	7
Base ventral fin - anal fin origin	25.7	27.7 (24.3-32.1)	9

Table 4. Meristic and morphometric characters of *Alionematchthys minyomma* (Sedor and Cohen, 1987)

	Holotype USNM 280122	Holotype + 10 paratypes and 28 non-types Mean (range)	n
Standard length in mm	66	53.3 (26-78)	39
Meristic characters			
Dorsal fin rays	75	74.7 (71-79)	19
Caudal fin rays	16	16	19
Anal fin rays	58	57.8 (55-61)	19
Pectoral fin rays	23	21.7 (21-23)	19
Precaudal vertebrae	10	10.8 (10-11)	19
Caudal vertebrae	29	29.1 (29-30)	19
Total vertebrae	39	39.8 (39-40)	19
Rakers on anterior gill arch	19	17.5 (15-19)	19
Pseudobranchial filaments	2	2	18
D/V	6	5.5 (5-6)	19
D/A	22	22.4 (21-25)	19
V/A	13	13.1 (12-14)	19
Morphometric characters in % of SL			
Head length	29.0	28.0 (26.6-29.8)	19
Head width	17.0	15.5 (13.8-17.5)	18
Head height	23.5	20.3 (18.0-23.7)	18
Snout length	-	7.0 (6.3-7.9)	15
Upper jaw length	15.5	14.8 (13.8-15.9)	19
Diameter of pigmented eye	1.5	2.0 (1.6-2.3)	19
Diameter of pupil	-	1.2 (0.9-1.6)	16
Interorbital width	8.5	8.1 (7.0-9.1)	19
Posterior maxilla height	6.0	5.0 (4.8-5.4)	18
Postorbital length	22.0	20.3 (19.3-21.5)	18
Precanal length	49.5	49.9 (45.4-56.0)	19
Predorsal length	32.5	32.1 (30.7-34.0)	19
Body depth at origin of anal fin	-	20.9 (18.9-23.4)	19
Pectoral fin length	13.5	14.8 (13.3-16.8)	18
Pectoral fin base height	-	7.1 (6.6-8.1)	15
Ventral fin length	28.0	25.6 (20.7-28.5)	19
Base ventral fin - anal fin origin	32.0	29.1 (25.9-32.1)	18

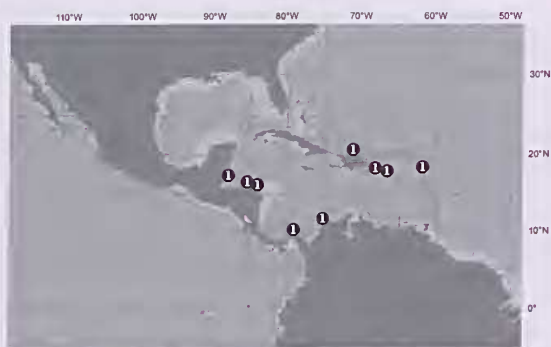


Fig. 7. Sample sites of *Alionematischthys minyomma* (Sedor and Cohen, 1987). One symbol may represent several samples.

Material examined. (40 specimens, 26–80 mm SL); see Møller *et al.*, 2004.

Diagnosis. Vertebrae 10–11+29–30=39–40, dorsal fin rays 71–79, anal fin rays 55–61; eyes small (1.5–2.3% SL); snout rounded, without cirri; scales only on cheeks; upper preopercular pore present; outer pseudoclasper broad-based, simple flap-shaped, about twice as large as inner pseudoclasper; inner pseudoclasper very short, its margin almost straight from short anterior pointed lobe to posterior lobe; isthmus between pseudoclaspers very wide; otolith length to height 2.2–2.3, with regular dorsal rim, otolith length to sulcus length 1.6, ostium length to cauda length about 3.5–4.0.

Remarks. For a detailed description and additional illustrations see Møller *et al.* (2004) (as *Dinematischthys minyomma*).

Comparison. *Alionematischthys minyomma* belongs to the small species group of the genus characterised by their small eyes and big head, further characterised by the lack of cirri and the presence of an upper preopercular pore. It is distinguished from the only other species of the group (*A. crassiceps*) by the lack of scales above the opercular spine, differences in the shape of the inner pseudoclaspers and the slender otoliths (otolith length to otolith height 2.2–2.3 vs 1.9–2.0).

Distribution. *Alionematischthys minyomma* represents the only species of the genus in the western tropical Atlantic (off Honduras, Atlantic Panama and Columbia, Haiti, Puerto Rico and northern Antilles) (Fig. 7) i.e. outside of the Indo-west Pacific.

Alionematischthys phuketensis sp. nov.

(Figs 1, 10, 11, Tables 1, 5)

Material examined. (9 specimens, 25–41 mm SL). HOLOTYPE – ZMUC P771659, male 40 mm SL, Rawai beach, Phuket, Thailand, 07°47'0"N, 98°19'0"E, J. Nielsen, 24 Nov. 1972. PARATYPES – ZMUC P771660–67, 1 male, 36 mm SL, 6 females, 28–41 mm SL, 1 juvenile, 25 mm SL, same data as holotype.

Diagnosis. Vertebrae 12+30–31=42–43, dorsal fin rays 81–89, anal fin rays 60–65; eyes moderately large (2.3–2.9% SL); body slender, snout pointed, without cirri; scales only on cheeks; no upper preopercular pore (occasionally single pore on one side); outer pseudoclasper broad-based, small; inner pseudoclasper small, anteriorly inclined flap; otolith length to height 2.1–2.3, with distinct postdorsal

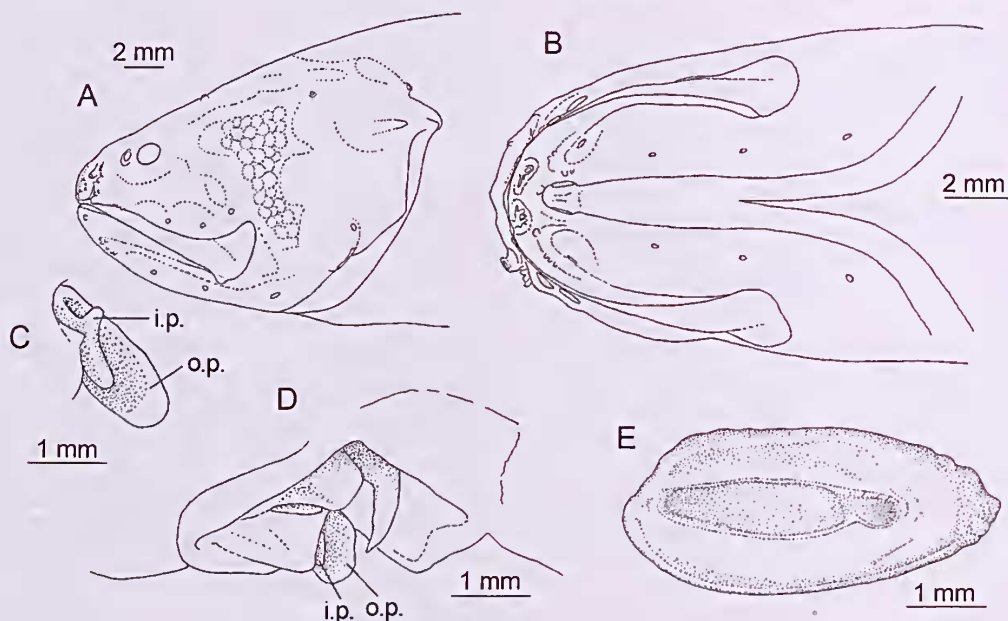


Fig. 8. *Alionematischthys minyomma* (Sedor and Cohen, 1987). A, lateral view of head, USNM 280123, male, 66 mm SL; B, ventral view of head, USNM 280123, female, 61 mm SL; C, view of left pseudoclaspers from inside, USNM 280123, male, 71 mm SL; D, inclined lateral view of male copulatory organ of same specimen; E, median view of right otolith, USNM 280123, male 71 mm SL.

Table 5. Meristic and morphometric characters of *Alionematichthys pluketensis* sp. nov.

	Holotype ZMUC P771659	Holotype + 8 paratypes Mean (range)	n
Standard length in mm	40	33.0 (25-41)	9
Meristic characters			
Dorsal fin rays	83	83.3 (81-89)	9
Caudal fin rays	15	15.2 (14-16)	6
Anal fin rays	62	62.9 (60-65)	9
Pectoral fin rays	20	19.9 (19-21)	7
Precaudal vertebrae	12	12	9
Caudal vertebrae	31	30.8 (30-31)	9
Total vertebrae	43	42.8 (42-43)	9
Rakers on anterior gill arch	18	16.0 (15-18)	6
Pseudobranchial filaments	2	2	4
D/V	6	6	9
D/A	24	23.1 (21-25)	9
V/A	14	13.3 (13-14)	9
Morphometric characters in % of SL			
Head length	26.8	26.7 (25.1-27.5)	9
Head width	12.5	11.7 (11.0-12.5)	9
Head height	15.0	15.1 (14.0-16.1)	9
Snout length	6.2	6.2 (5.6-6.5)	9
Upper jaw length	13.1	12.9 (12.5-13.7)	9
Diameter of pigmented eye	2.9	2.6 (2.3-2.9)	9
Diameter of pupil	1.8	1.6 (1.4-1.8)	9
Interorbital width	7.3	7.3 (6.9-7.9)	9
Posterior maxilla height	4.4	3.7 (3.3-4.4)	9
Postorbital length	18.4	18.6 (17.9-19.4)	8
Precanal length	44.9	43.4 (41.0-45.6)	9
Predorsal length	31.0	30.7 (29.2-32.2)	9
Body depth at origin of anal fin	16.9	15.3 (13.7-16.9)	9
Pectoral fin length	12.4	13.2 (11.9-15.0)	9
Pectoral fin base height	5.2	5.8 (5.2-6.3)	9
Ventral fin length	19.8	23.5 (19.8-24.8)	9
Base ventral fin - anal fin origin	25.2	23.9 (22.4-25.2)	9

projection, otolith length to sulcus length 1.6–1.7, ostium length to cauda length 3.0–3.3.

Description (Figs 10, 11). The principal meristic and morphometric characters are shown in Table 5. Mature at about 40 mm SL (largest male at 40 mm SL probably subadult). Body slender, with pointed head profile. No cirri on snout. Eye size 2.3–2.9 (2.9)% SL. Head with scale patch on cheek containing 7 vertical rows of scales on upper part and 4 vertical rows on lower part. Horizontal diameter of scales on body about 1.5% SL, in about 30 horizontal rows. Maxillary ending far behind eye, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end expanded. Anterior nostril positioned high, 1/3 distance from upper lip to anterior margin of eye. Posterior nostril small, about 1/8 the size of eye. Opercular spine with free tip, thin and sharply pointed. Anterior gill arch with 15–18 (18) rakers, 3 elongate. In holotype and two paratypes,

lower two elongate rakers interrupted by one plate-like raker. In rest of paratypes, three elongate rakers in single row. Pseudobranchial filaments 2.

Head sensory pores (Fig. 11A, B). Supraorbital pores 2. Infraorbital pores 6 (3 anterior and 3 posterior), three posterior pores about 1/3 the size of three anterior pores. Mandibular pores 6 (3 anterior and 3 posterior): first anterior pore large, tubular, without cirri. Preopercular pores: 3 lower, first and second with joined opening, covered by dermal flap in lateral view; third non-tubular; no upper preopercular pore (rarely single pore on one side). [See description of *Alionematichthys ceylonensis* for position of pores.]

Dentition (of holotype). Premaxilla with 5 outer rows of granular teeth and 1 inner row of larger teeth anteriorly. Anteriormost teeth in inner row up to 1/4 diameter of pupil. Vomer horseshoe-shaped, with 1 outer row of small teeth and 1 inner row of large teeth up to 1/5 diameter of pupil. Palatine with 3 outer rows of small teeth and 1 inner row of large teeth up to 1/5 diameter of pupil. Dentary with 5 outer rows of granular teeth and 1 inner row of larger teeth anteriorly, up to about 1/3 diameter of pupil.

Otolith (Fig. 11E–G). Elongate in shape, length to height 2.1–2.3 (36–41 mm SL) and moderately thin (otolith height to otolith thickness about 1.6). Anterior tip moderately pointed, posterior tip expanded and irregularly ornamented. Dorsal rim shallow, with distinct postdorsal projection and furrow thereafter. Inner face moderately convex, outer face almost flat, both smooth. Otolith length to sulcus length 1.6–1.7. Sulcus slightly supramedially positioned, slightly inclined, with separated colliculi and marked notch at ventral rim of sulcus at joint of ostium with cauda. Ostium length to cauda length 3.0–3.3. Ventral furrow very close to ventral rim of otolith.

Axial skeleton. Neural spine of vertebra 4 inclined and 5–8 depressed. Parapophyses present from vertebrae 6 to 12. Pleural ribs on vertebrae 2 to 11. First anal fin pterygiophore not or only slightly longer than subsequent pterygiophore.

Male copulatory organ (Fig. 11C, D). Two pairs of small pseudoclaspers, which may not be fully mature in all specimens investigated. Outer pseudoclasper a simple flap with broad base; inner pseudoclasper a forward inclined small flap without significant indentation. Isthmus moderately narrow; penis curved, longer than outer pseudoclaspers.

Colour. Live colour unknown. Preserved colour uniformly light brown.

Comparison. *Alionematichthys pluketensis* belongs to the species group without an upper preopercular pore together with *A. ceylonensis*, *A. plicatosurculus* sp. nov. and *A. shinoharai* sp. nov. It differs from all of them in the combination of a slender body shape with a pointed snout and the peculiar postdorsal projection of the otolith rim. From *A. plicatosurculus* sp. nov., it differs further in the simple inner pseudoclasper morphology and from

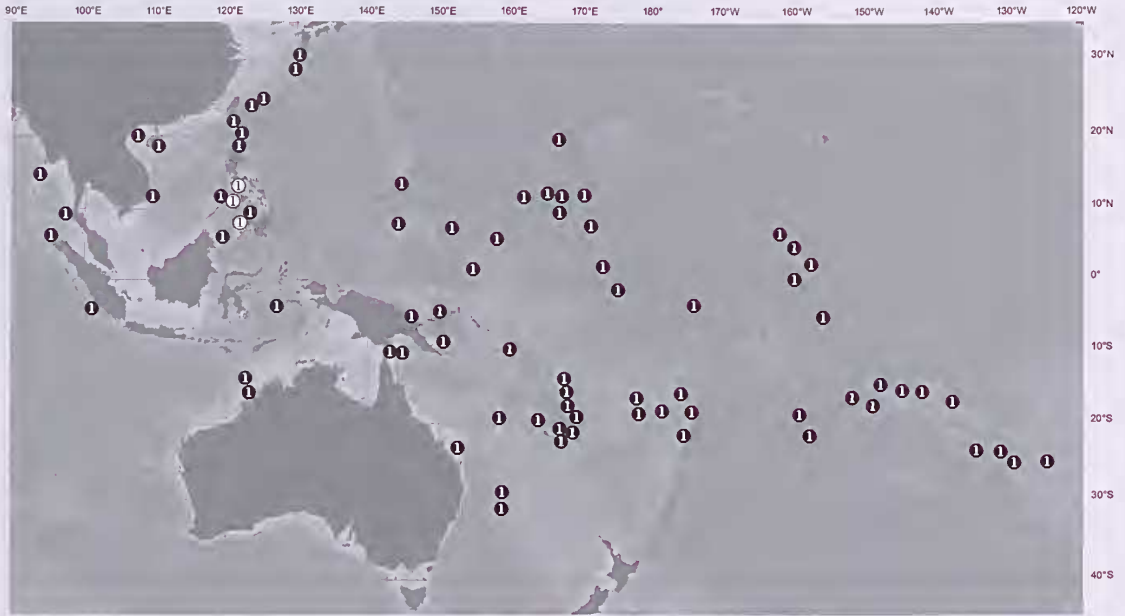


Fig. 9. Sample sites of ○ *Alionematchthys suluensis* sp. nov. and ● *A. piger* (Alcock, 1890). One symbol may represent several samples.

A. shinoharai sp. nov., in the lack of scales above the opercular spine (vs two), the longer sulcus (otolith length to sulcus length 1.6–1.7 vs 1.9–2.0) and the notch at the ventral sulcus margin at the joint of ostium and cauda (vs no notch). *Alionematchthys pluketensis* co-occurs with *A. piger*, *A. riukiuensis* and *Dinematchthys ihuocoeteoides*. From the latter two it differs readily in the absence of scales above the opercular spine (vs present or entire opercle with scales in *D. ihuocoeteoides*). From *A. piger* it differs in the lack of cirri on the snout, the lack of an upper preopercular pore and the peculiar dorsal projection of the otolith rim.

Distribution. *Alionematchthys pluketensis* so far is only known from the type locality, Ravai Beach near Phuket, Thailand (Fig. 1).

Etymology. Named after the type locality, the town of Phuket, Thailand. It is an adjective.

***Alionematchthys piger* (Alcock, 1890)**

(Figs 9, 12, 13, Tables 1, 6)

Dinematchthys piger Alcock, 1890: 432 (Great Coco Island, Andaman Islands); Alcock, 1905: plate 37, fig. 3;

?*Brotnulina piger* (Alcock, 1890). — Nielsen *et al.* 1999: 126.

Material examined. 2288 specimens, 16–84 mm SL. AMS I.17094-070, 3 males, 5 females, 11 juveniles, 08°30'S, 151°05'E, Kiriwina Islands (Trobriand), Papua New Guinea; AMS I.17102-004, 2 specimens, 08°30'S 151°05'E, Kiriwina Islands (Trobriand), Papua New Guinea; AMS I.17424-012, 1 female, 31°32'S, 159°04'E, Lord Howe Island; AMS I.18052-040, 2 females, 28–30 mm SL, 01°44'N, 172°59'E, Abaiang Atoll, Gilbert Islands, Kiribati; AMS I.20629-001, 3 males, 10 females, 12°N,

165°E, Bikini Atoll, Marshall Islands; AMS I.27134-040, 1 female, 29°27'2"S, 159°06'8"E, Lord Howe Island, 6–9 m; AMS I.27138-047, 1 male, 46 mm SL, 2 females, 34–67 mm SL, 29°27'8"S, 159°05'E, Middleton Reef, Lord Howe Rise, Tasman Sea, 4–9 m; AMS I.27148-029, 1 female, 29°57'S, 159°01'2"E, Elizabeth Reef, Tasman Sea, 0–10 m; AMS I.27891-040, 1 specimen, 29°56'S, 159°01'E, Elizabeth Reef, Tasman Sea, 0–5 m; AMS I.28950-045, 2 specimens, 17°29'1"S, 149°51'3"W, Moorea, French Polynesia, 8–12 m; AMS I.33740-026, 3 males, 49–59 mm SL and 6 females, 10°09.58"S, 144°34.94"E, Ashmore Reef, Coral Sea; AMS I.34510-020, 42 specimens, 15°44.8'S, 144°38.9'W, Taiaro Atoll, Tuamotu Islands, 0–2 m; AMS I.37315-032, 2 males, 65–75 mm SL, 4 females, 40–54 mm SL, 18°44'45"S, 169°12'68"E, Erromango, Vanuatu, 0–6 m; AMS I.39387-001, 12 specimens, Pelagai Island, Guam, 1–2 m; BPBM 7553, 1 male, 4 females, Fanning Island, Line Islands; BPBM 8009, 2 males, 5 females, Marshall Islands; BPBM 8242, 1 male, 2 females, Enewetak Atoll, Marshall Islands; BPBM 8651, 1 male, 5 females, Tahiti; BPBM 8658, 1 female, Tahiti; BPBM 9311, 1 female, Chuuk, Micronesia; BPBM 10240, 1 specimen, Rangihoa, Tuamotu Islands; BPBM 10307, 2 specimens, Rangihoa, Tuamotu Islands; BPBM 10658, 1 male and 9 females, Gilbert Island, Kiribati; BPBM 10830, 1 specimen, Aitutaki, Cook Islands; BPBM 11588, 1 female, Tahiti; BPBM 12254, 1 male, 2 juveniles, Ducie, Pitcairn; BPBM 13574, 1 male and 1 female, Mangareva, Gambier Islands, French Polynesia; BPBM 13915, 2 females, Rarotonga, Cook Islands; BPBM 13929, 1 male, Rarotonga, Cook Islands; BPBM 14161, 1 female, Palmyra Atoll, Line

Islands; BPBM 14788, 1 male, 3 females, Lord Howe Island; BPBM 15169, 1 male, 1 female, Wake Island, USA; BPBM 15199, 1 male, 58 mm SL, 6 females, 26–60 mm SL, Kiritimati, Line Islands; BPBM 15323, 1 male, 4 females, Betio, Tarawa Atoll, Kiribati; BPBM 15616, 1 female, Guadalcanal, Solomon Islands; BPBM 16495, 5 males, 7 females, Pitcairn, Polynesia; BPBM 16534, 2 males, 1 female, Oeno, Pitcairn; BPBM 16607, 1 female, Oeno, Pitcairn; BPBM 16912, 2 females, Pitcairn; BPBM 16970, 2 males, 31 and 59 mm SL, 5 females, 28–55 mm SL, Pitcairn; BPBM 16993, 1 female, Pitcairn; BPBM 17042, 3 females, Pitcairn; BPBM 17223, 1 male, 1 female, Mangareva, Gambier Islands, French Polynesia; BPBM 17690, 1 female, Ryukyu Islands, Japan; BPBM 22357, 2 females, Marshall Islands; BPBM 22834, 2 males, 1 female, Similan Island, Thailand; BPBM 23262, 1 male and 3 females, Taiwan; BPBM 23338, 2 males and 2 females, Taiwan; BPBM 33514, 1 male, Chesterfield Bank, Coral Sea; BPBM 37451, 1 female, Kiritimati; BPBM 38268, 1 female, Tonga; BPBM 38773, 2 males, Tahiti; CAS 227288, 43 specimens, Ifalik Atoll, Micronesia; CAS 57943, 3 specimens, Raroia, Tuamotu Islands; CAS 65671, 1 female, Madang, Papua New Guinea; CAS 81437, 29 specimens, Raroia, Tuamotu Islands; CAS 227280, 1 juv, 21 mm SL, 24 males 40–63 mm SL, 27 females 42–71 mm SL, Kapingamarangi Atoll, Micronesia; CAS 81446, 16 specimens, Ifalik Atoll, Micronesia; CAS 81451, 4 specimens, Kapingamarangi Atoll, Micronesia; CAS 81468, 52 specimens, Raroia, Tuamotu Islands; CAS 81483, 96 specimens, Kapingamarangi Atoll, Micronesia; CAS 222525, 29 specimens, Fiji; CAS 222527, 2 specimens, Fiji; CAS 222531, 1 female, Fiji; CAS 222537, 1 female, Fiji; CAS 227283, 2 specimens, Fiji; CAS 222549, 2 specimens, Fiji; CAS 222553, 2 specimens, Fiji; CAS 222554, 4 specimens, Yadua Island, Fiji; CAS 222556, 5 specimens, Fiji; CAS 222569, 1 specimen, Bua Bay, Fiji; CAS 227286, 2 specimens, Vanua Levu, Fiji; CAS 222572, 1 specimen, Vanua Levu, Fiji; CAS 222582, 5 specimens, Balvu Harbour, Fiji; CAS 227293, 61 specimens, Fiji; CAS 222601, 45 specimens, Budd Reef, Fiji; CAS 222604, 9 specimens, Fiji; CAS 222606, 20 specimens, Suva, Fiji; CAS 222607, 40 specimens, Suva, Fiji; CAS 227301, 1 specimen, Suva, Fiji; CAS 222625, 8 specimens, Suva, Fiji; CAS 222626, 13 specimens, Suva, Fiji; CAS 222633, 19 specimens, Suva, Fiji; CAS 222640, 2 specimens, Suva, Fiji; KAUM-I. 2042, 1 female, 77 mm SL, off Okinoerabu Island, Kagoshima, Japan, July 1962; KAUM-I. 10652, 1 female, 76 mm SL, off Okinoerabu Island, Kagoshima, Japan; KAUM-I. 10655, 1 female, 56 mm SL, off Okinoerabu Island, Kagoshima, Japan; KAUM-I. 10658, 1 male, 49 mm SL, off Okinoerabu Island, Kagoshima, Japan; KAUM-I. 10663, 1 male, 33 mm SL, off Okinoerabu Island, Kagoshima, Japan; KAUM-I. 11482–83, 1 male, 58 mm SL and 1 female, 50 mm SL, 30°27'23"N, 130°29'59"E, Iiso, Yakushima Island, Kagoshima, Japan; MCZ 158557, 1 specimen, 04°27'S, 171°13'W, Manra Atoll, Kiribati;

MCZ 162572, 4 specimens, 04°27'S, 171°14'W, Manra Atoll, Kiribati; MCZ 162573, 5 specimens, 04°27'S 171°15'W, Manra Atoll, Kiribati; MNHN 1976-0218, 3 females, 54–56 mm SL, Marshall Islands; MNHN 1980-0563, 2 specimens, New Caledonia; MNHN 1980-0696, 1 female, New Caledonia; MNHN 1980-0961, 1 male, 65 mm SL, 1 female, New Caledonia; NMNZ P.035811, 1 male, 44 mm SL, 1 female, 35 mm SL, Niue, Polynesia; NSMT-P 55637, 5 specimens, Hainan Island, China; NSMT-P 55823, 2 males, 3 females and 1 juvenile, Hainan Island, China; ROM 82976, 10 specimens, 18°45'52"S, 178°31'13"E, Fiji; ROM 47600, 5 specimens, 18°46'30"S, 178°30'28"E, Fiji; ROM 47601, 10 specimens, 18°46'13"S, 178°28'05"E, Fiji; ROM 61176, 7 specimens, 17°31'00"S, 149°55'30"W, Society Islands; ROM 61180, males, 30 and 47 mm SL, female 35 mm SL, 17°36'31"S, 149°48'42"W, Society Islands; ROM 82979, 1 female, 22°21'00"S, 166°21'00"E, New Caledonia; ROM 82978, 1 female, 68 mm SL, 20°48'51"N, 107°05'13"E, Vietnam; RUSI 40747, 7 specimens, Kiritimati, Kiribati; SMNS 17837, 1 specimen, 41 mm SL, Aitutaki Island, Cook Islands, 18°50'34"S, 159°47'28"W, 0.2–3.5 m depth. SMNS 19762, 11 specimens, 21°38'57"S, 166°18'31"E, New Caledonia, 0–8.5 m; SMNS 25171, 4 specimens, 21°35'45"S, 167°50'06"E, Loyalty Islands, New Caledonia, 2–3.8 m; SMNS 21646, 13 specimens, 20°53'35"S, 167°08'02"E, Loyalty Islands, New Caledonia, 0–2.5 m; SMNS 22732, 1 male, 1 female, 20°36'30"S, 164°51'50"E, 0–6 m; SMNS 22782, 1 male, 20°31'49"S, 164°47'01"E, New Caledonia, 0.2–3.5 m; SMNS 22918, 5 specimens, 20°52'10"S, 167°08'02"E, Loyalty Islands, New Caledonia, 0–3 m; SMNS 22967, 5 specimens, 20°51'45"S, 167°08'10"E, Loyalty Islands, New Caledonia, 0–3.5 m; SMNS 23747, 1 male, 1 female, 20°46'54"S, 167°08'19"E, Loyalty Islands, New Caledonia, 0–3 m; SMNS 23923, 8 specimens, 20°47'11"S, 167°07'20"E, Loyalty Islands, New Caledonia, 0–3 m; SMNS 24849, 18 specimens, 21°56'13"N, 120°47'53"E, Taiwan; SMNS 24864, 2 specimens, 21°56'13"N, 120°47'53"E, Taiwan; SMNS 24866, 1 specimen, 21°56'13"N, 120°47'53"E, Taiwan; UF 42494, 2 males, 1 female, Enewetak Atoll, Marshall Islands; USNM 376214, 2 males, 04°01'S, 101°01'E, Sumatra, Mentawai; USNM 384607, 24 specimens, 21°N, 120°E, Taiwan; USNM 224327, 34 specimens, 05°51'N, 158°20'E, Pohnpei, Micronesia, 0–2 m; USNM 297347, 59 specimens, 20°24'45"N, 121°55'02"E, Batanes, Philippines, 0–6 m; USNM 384608, 10 specimens, 18°51'N 121°22'E, Fuga Island, Philippines; USNM 384604, 17 specimens, 19°51'36"S, 174°25'06"W, Tonga, 0–2 m; USNM 338463, 18 specimens, 18°40'55"S, 174°06'09"W, Vava'u Group, Luamoko Island, Tonga, 0–3 m; USNM 384605, 26 specimens, 18°44'31"S, 174°06'36"W, Vava'u Group, Tonga, 0–11 m; USNM 384593, 6 specimens, 20°29'12"S, 166°19'18"E, Loyalty Islands, New Caledonia, 3–10 m; USNM 384601, 38 specimens, 19°31'33"S, 169°29'50"E, Tanna, Vanuatu, 1–5 m; USNM 394979, 3 females,



Fig. 10. *Alionematchichthys phuketensis* sp. nov., ZMUC P771659, holotype, male, 40 mm SL.

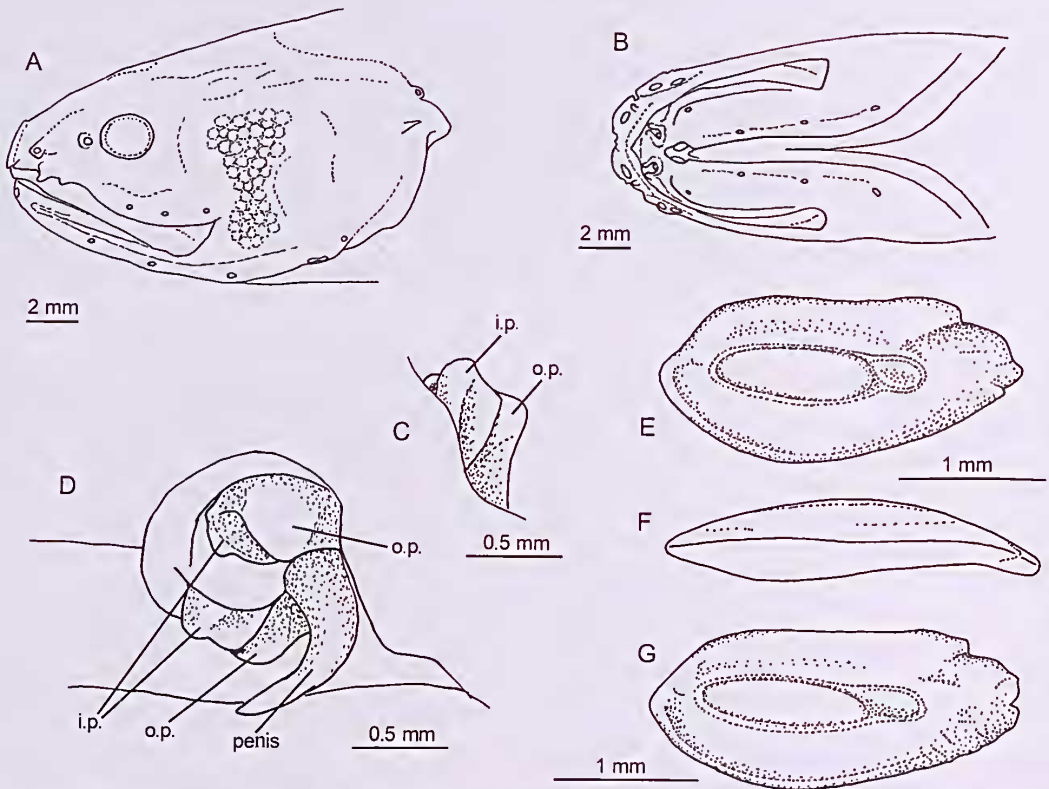


Fig. 11. *Alionematchichthys phuketensis* sp. nov., A, lateral view of head, ZMUC P771661, male, 37 mm SL; B, ventral view of head, ZMUC P771661, male, 36 mm SL; C, view of left pseudoclaaspers from inside, holotype; D, inclined lateral view of male copulatory organ, holotype; E, median view of right otolith, holotype; F, ventral view of right otolith, holotype; G, median view of right otolith, ZMUC P771660, female, 41 mm SL.

13°52'25"S, 167°33'20"E, Banks Islands, Vanuatu, 9–13 m; USNM 366488, 3 females, 28–43 mm SL, Phuket, Thailand; USNM 366507, 23 males, 40–84 mm SL, 35 females, 39–71 mm SL, Kiriwina Islands (Trobriand), Papua New Guinea; USNM 366510, 3 males and 19 females, 39–64 mm SL, 05°33'N, 95°09'E, Pulau Boenta, Sumatra; USNM 366569, 2 females, 62–84 mm SL, 23°25'S, 151°55'E, Heron Island, Queensland, Australia; USNM 394980, 1 female, 10°35'05"N, 122°08'30"E; Iloilo, Philippines, 0–7 m; USNM 374192, 1 female, 44 mm SL, 09°06'N, 122°55'E, Negros Island, Philippines; USNM 376177, 1 male, 45 mm SL, Taiwan; USNM

376178, 1 female, 18°56'34"S, 168°59'34"E, Erromango, Vanuatu, 0–6 m; USNM 376180, 3 males and 7 females, 46–62 mm SL, 08°29'N, 97°39'E, Thailand; USNM 376187, 1 male, 52 mm SL, Sabah; WAM P.29081-016, 3 females, 15°31'S, 123°09'E, Adele Island, Western Australia, 0.1–2.0 m; WAM P.30633-017, 1 female, 05°09'S, 145°50'E; WAM P.31646-002, 1 male, 13°S 121°E; YCM-P 30026, 1 female, Ishigaki Island, South Ryukyu Islands, Japan; YCM-P 34215, 1 female, Kakeroma Island, Amami Island, North Ryukyu Islands, Japan.

Additional material. USNM 115392, 1 male, 43 mm SL, Phoenix Islands, Kiribati; USNM 115395, 1 male, 52



Fig. 12. *Alionematichthys piger* (Alcock, 1890), AMS Lex. 37315-032, male, 65 mm SL.

mm SL, Phoenix Island, Kiribati; USNM 142010, 4 males and 4 females, 28–42 mm SL, Rongerik Atoll, Marshall Islands; USNM 374219, 5 males and 5 females, 25–45 mm SL, Rongelap Atoll, Marshall Islands; USNM 142012, 1 male, 45 mm SL, Kwajalein Atoll, Marshall Islands; USNM 142013, 11 specimens, 40–62 mm SL, Enewetak Atoll, Marshall Islands; USNM 142014, 9 specimens, 16–40 mm SL, Bikini Atoll, Marshall Islands; USNM 142017, 18 females, 27–58 mm SL, Bikini Atoll, Marshall Islands; USNM 374220, 46 specimens, 32–57 mm SL, Bikini Atoll, Marshall Islands; USNM 142020, 92 specimens, 28–56 mm SL, Bikini Atoll, Marshall Islands; USNM 374215, 2 males and 1 female, 45–58 mm SL, Arno Atoll, Marshall Islands; USNM 167355, 3 males and 7 females, 40–55 mm SL, Onotoa, Gilbert Islands, Kiribati; USNM 210154, 1 male, 32 mm SL, Seram, Tandjungliang, Indonesia; USNM 376161, 86 specimens, 30–84 mm SL, Taiwan; USNM 263663, 5 males and females, 48–60 mm SL, Tahiti, French Polynesia; USNM 263674, 19 males and 42 females, 25–56 mm SL, 16°00'S, 175°53'W, Tonga; USNM 263690, 30 specimens, 29–57 mm SL, 10°55'N, 121°02'E, Palawan, Philippines; USNM 263711, 1 male, 86 mm SL, 21°55'N, 120°49'E, Taiwan; USNM 300090, 1 male and 2 females, 40–45 mm SL, 20°25'N, 121°57'E, Batanes Islands, Philippines; USNM 300093, 7 males and 8 females, 38–75 mm SL, 20°20'N, 121°49'E, Batanes Islands, Philippines; USNM 300098, 1 female, 47 mm SL, 20°28'N, 121°58'E, Batanes Islands, Philippines; USNM 300102, 1 male and 2 females, 21°07'N, 121°56'E, Batanes Islands, Philippines; USNM 319899, 7 males and females, 45–73 mm SL, Ouvéa, Loyalty Islands; USNM 329746, 17 males and 12 females, 31–57 mm SL, 21°18'S, 174°26'W, Tonga; USNM 333251, 3 males and females, 29–41 mm SL, Tongatapu, Tonga; USNM 336507, 2 females, 55–60 mm SL, 21°25'S, 174°56'W, Tonga; USNM 374214, 6 males and 3 females, 35–55 mm SL, 19°16'S, 174°22'W, Tonga; USNM 338465, 35 specimens, 32–61 mm SL, Vavau, Tonga; USNM 338966, 7 males and 2 females, 30–45 mm SL, 18°42'S, 174°02'W, Tonga; USNM 338967, 9 males and 14 females, 30–50 mm SL, 18°38'S, 174°04'W, Tonga; USNM 352073, 1 female, 47 mm SL, 16°35'S, 168°06'E, Lamen Island, Vanuatu; USNM 352742, 123 specimens,

38–80 mm SL, 18°44'S, 169°12'E, Erromango, Vanuatu; USNM 358502, 18 males and females, 24–71 mm SL, Tanna, Vanuatu; USNM 361266, 7 females, 35–80 mm SL, 13°44'S, 167°24'E, Banks Islands, Vanuatu; USNM 376169, 1 female, 48 mm SL, 15°00'S, 168°03'E, Maewo, Vanuatu; USNM 366200, 5 males and females, 17–65 mm SL, Tonga; USNM 366222, 5 males and females, 38–61 mm SL, Line Islands; USNM 366223, 1 male, 51 mm SL, Starbuck Atoll, Line Islands; USNM 366225, 1 male, 2 females, Bora Bora, Society Islands; USNM 366489, 2 females, 34–49 mm SL, Taka Atoll, Marshall Islands; USNM 376218, 1 female, 44 mm SL, 04°14'S, 152°10'E, Bismarck Archipelago, Papua New Guinea; USNM 366511, 2 females, 36 mm SL, Amami, Kikai Island, Ryukyu Islands; USNM 376213, 2 females, 38–63 mm SL, Kiriwina Islands (Trobriand); USNM 366556, 1 female, 38 mm SL, Taiwan; USNM 366560, 1 female, 49 mm SL, 25°12'N, 121°41'E, Taiwan; USNM 366561, 12 specimens, 43–78 mm SL, 25°12'N, 121°41'E, Taiwan; USNM 366574, 2 males and 8 females, 44–51 mm SL, Kwajalein Atoll, Marshall Islands; USNM 366575, 1 male, 35 mm SL, Phoenix Atoll, McKean Island; USNM 374221, 1 female, 52 mm SL, Kwajalein Atoll, Marshall Islands; USNM 366719, 1 male and 2 females, 51–67 mm SL, Jarvis Island, Line Islands; USNM 366725, 2 males and 1 female, 40–51 mm SL, Bora Bora, Society Islands; USNM 366843, 1 male and 1 female, 54–55 mm SL, 20°37'S, 178°40'E, Fiji; USNM 376211, 1 male and 4 females, 30–48 mm SL, 18°57'S, 178°17'E, Fiji; USNM 366847, 1 male, 49 mm SL, 18°56'S, 178°21'W, Fiji; USNM 366848, 2 males and 4 females, 32–45 mm SL, 17°47'S, 177°13'E, Fiji.

Diagnosis. Vertebrae 11–12+29–33=40–45, dorsal fin rays 72–88, anal fin rays 55–70; eyes moderately large (1.7–2.8% SL); body slender, snout rounded, with many cirri; scales only on cheeks (rarely 1–2 scales above opercular spine); upper preopercular pore present; outer pseudoelasper broad-based, large, often extending beyond hood in resting position; inner pseudoelasper small, anterior and posterior lobes of equal size; otolith length to height 1.9–2.1, with gently curved dorsal rim, otolith length to sulcus length 1.5–1.6, ostium length to cauda length 3.5–4.5.

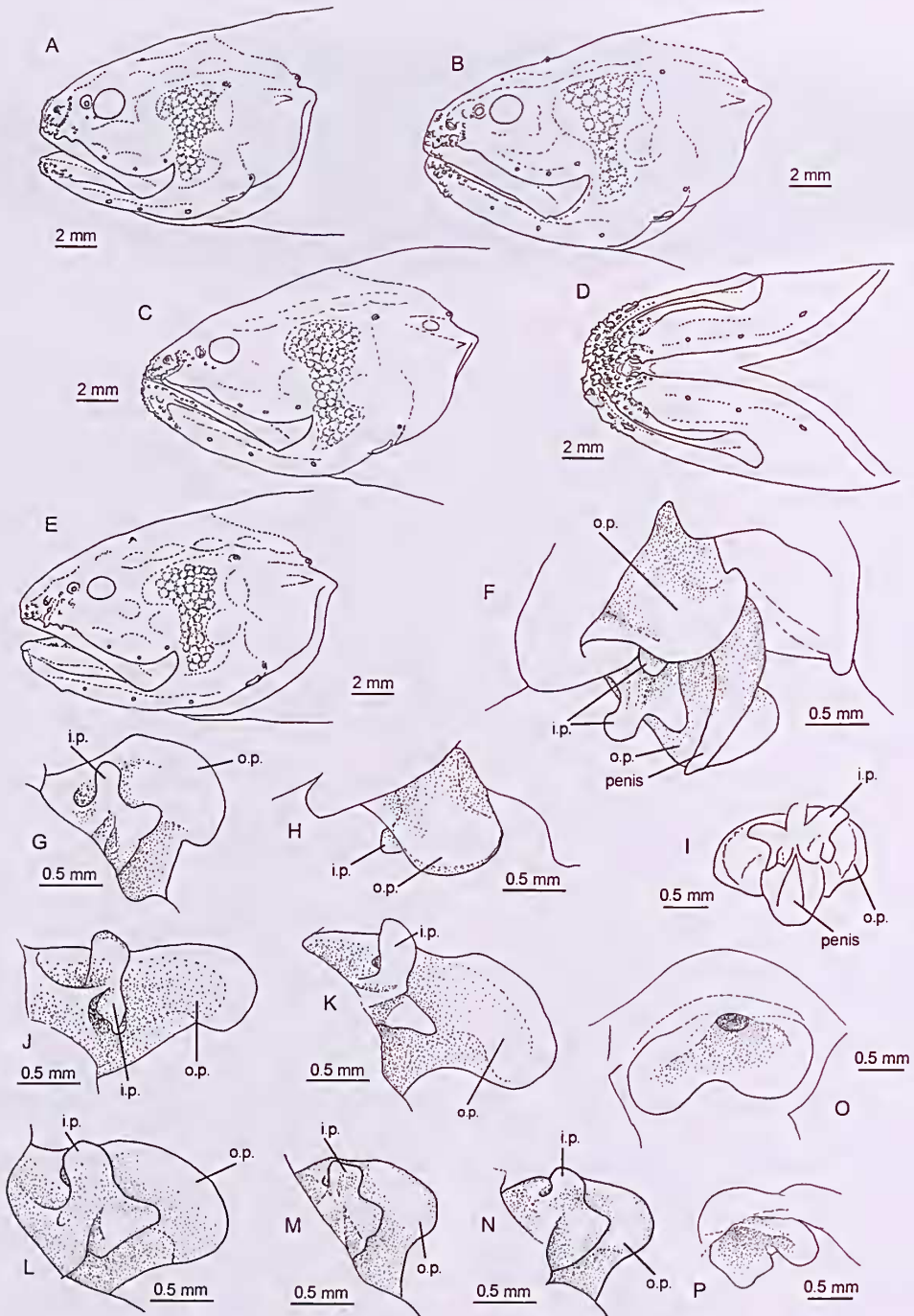


Fig. 13 (part). *Alionemachthys piger* (Alcock, 1890), **A**, lateral view of head, ROM 82976, male, 51 mm SL; **B**, lateral view of head, USNM 384707, male, 61 mm SL; **C**, lateral view of head, USNM 366507, male, 54 mm SL; **D**, ventral view of head, USNM 384707, male, 61 mm SL; **E**, lateral view of head, CAS 227288, female, 51 mm SL; **F**, inclined lateral view of male copulatory organ, USNM 376180, male, 57 mm SL; **G**, view of left pseudoclaspers from inside, USNM 376180, male, 57 mm SL; **H**, view of left pseudoclaspers from outside, USNM 376180, male, 44 mm SL; **I**, ventral view of male copulatory organ, USNM 366507, male, 54 mm SL; **J**, view of left pseudoclaspers from inside, SMNS 17837, 41 mm SL; **K**, view of left pseudoclaspers from inside, ROM 82976, 43 mm SL; **L**, view of left pseudoclaspers from inside, MNHN 1980-0961, 65 mm SL; **M**, view of left pseudoclaspers from inside, CAS 227288, male, 59 mm SL; **N**, view of left pseudoclaspers from inside, BPBM 8009, male, 43 mm SL; **O**, ventral view of female copulatory organ, SMNS 19762, 85 mm SL; **P**, inclined lateral view of female copulatory organ, SMNS 19762, 85 mm SL.

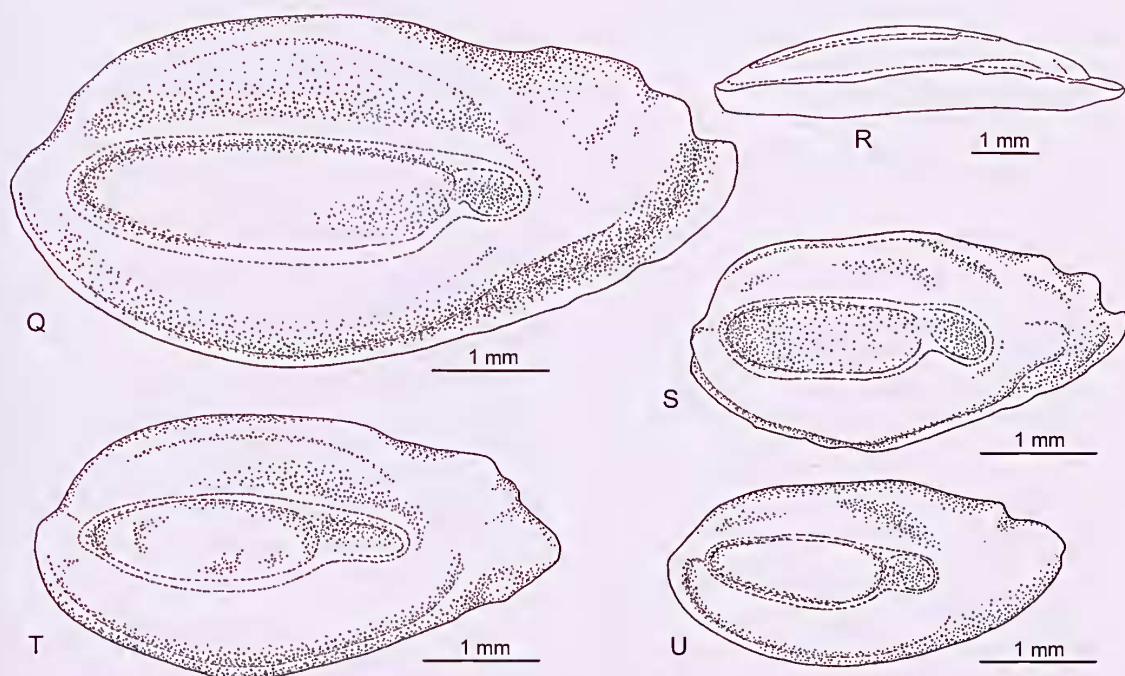


Fig. 13 (continued). Q, median view of right otolith, USNM 297347, male, 67 mm SL; R, ventral view of right otolith, USNM 297347, male, 67 mm SL; S, median view of right otolith, USNM 384605, male, 52 mm SL; T, median view of right otolith, AMS I.23381-001, isolated otolith; U, median view of right otolith, MNHN 1976-0218, female, 56 mm SL.

Description (Figs 12, 13). The principal meristic and morphometric characters are shown in Table 5. Mature at about 40 mm SL. Body slender, with rounded head profile. Many cirri on snout. Eye size 1.7–2.8 (2.6)% SL. Head with scale patch on cheek containing 6–9 vertical rows of scales on upper part and 3–4 vertical rows on lower part. Horizontal diameter of scales on body of a 65 mm SL male (AMS I.37315-032) about 1.8% SL, in about 27 horizontal rows. Maxillary ending far behind eye, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end expanded. Anterior nostril positioned high, 1/2.5 distance from upper lip to anterior margin of eye. Posterior nostril small, about one-fifth to one-sixth the size of eye. Opercular spine with free tip, thin and sharply pointed. Anterior gill arch with 13–19 rakers, 3 elongate, sometimes with short plate-like raker between the two lower elongate rakers. Pseudobranchial filaments 2.

Head sensory pores (Fig. 13A–E). Supraorbital pores 2 to 3. Infraorbital pores 6 (3 anterior and 3 posterior), three posterior pores about 1/3 the size of three anterior pores. Mandibular pores 6 (3 anterior and 3 posterior): first anterior pore large, tubular, without cirri. Preopercular pores: 3 lower, first and second with joined opening, covered by dermal flap in lateral view; third nontubular; upper preopercular pore present. [See description of *Alionematichthys ceylonensis* for position of pores.]

Dentition (of a 59 mm SL specimen – USNM 376180). Premaxilla with 5 outer rows of granular teeth and 2 inner

row of larger teeth anteriorly. Anteriormost teeth in inner row up to 1/2 diameter of pupil. Vomer horseshoe-shaped, with 2 outer rows of small teeth and 1 inner row of larger teeth up to 1/3 diameter of pupil. Palatine with 2 outer rows of small teeth and 1 inner row of larger teeth up to 1/3 diameter of pupil. Dentary with 5 outer rows of granular teeth and 1 inner row of larger teeth anteriorly, up to about 3/4 diameter of pupil.

Otolith (Fig. 13Q–U). Moderately elongate in shape, length to height 1.9–2.1 and thin (otolith height to otolith thickness about 2.3). Anterior tip broadly rounded, posterior tip expanded and irregularly ornamented. Dorsal rim gently curved, without distinct angles. Inner face moderately convex, outer face almost flat, both smooth. Otolith length to sulcus length 1.5–1.6. Sulcus slightly supramedially positioned, slightly inclined, with separated colliculi and marked notch at ventral rim of sulcus at joint of ostium with cauda. Ostium length to cauda length 3.5–4.5. Ventral furrow very distinct and close to ventral rim of otolith.

Axial skeleton. Neural spine of vertebra 4 inclined and 5–8 depressed. Parapophyses present from vertebrae 6 to 11 (12). Pleural ribs on vertebrae 2 to 10 (11). First anal fin pterygiophore not or slightly longer than subsequent pterygiophore.

Male copulatory organ (Fig. 13G–N). Two pairs of pseudoclasps, outer usually very large and extending beyond hood in resting position. Outer pseudoclasper a large, flat flap with broad base; inner pseudoclasper short,

sometimes compressed, with anterior thorn and posterior lobe being equal in size. Isthmus narrow; penis curved, about as long as outer pseudoelasper.

Female copulatory organ (Fig. 13O, P). Few female specimens of *A. piger* show soft dermal flaps around the vagina which may reach a quite considerable size, as in the figured specimens but do not exhibit diagnostic valuable morphology.

Colour. According to Alcock (1890: 433), the live colour is uniform dark brown, almost black. The preserved colour is similar.

Variability. *Alionematchthys piger* is remarkable for an unusual wide variation in pseudoclasper morphology that does not follow a geographic pattern. The majority of the male specimens show a relatively large outer pseudoelasper for a member of this genus, extending beyond the hood in resting position and about twice as long as the inner pseudoelasper. In extreme forms the inner pseudoelasper is depressed (Fig. 13J, K). On the other extreme, the inner pseudoelasper is rather stubby and the outer pseudoelasper less than half the length of the inner pseudoelasper and not extruding in resting position (Fig. 13M, N). The very large variation is also reflected in the meristic counts (Tables 1, 5) and variations in the amount of cirri on the snout (Fig. 13A–E) which may represent geographic variances. Otherwise, heads (Fig. 13A–E) and otoliths (Fig. 13Q–U) of fishes with such diverse pseudoelaspsers do not document matching variation.

Remarks. Alcock (1890) described *Dinematichthys piger* from Great Coco Island, Andaman Islands. The unique holotype of *D. piger* (ZSI F12939) was not available for review (see also Schwarzhans and Møller 2007: 66). According to Alcock's description it is a 61 mm long specimen with 75 dorsal fin rays, 55 anal fin rays and 90 scales along the lateral line and his figure shows a fish with a rather high position of the anterior nostril at 1/3 the distance from upper lip to aggregate distance to anterior margin of eye and no scales on the opercle.

The latter two observations agree with a species of the genus *Alionematchthys*. There are two species of the genus *Alionematchthys* observed along the shores of the Andaman Sea, one without scales above the opercle, the other with many scales above the opercle. The latter has been attributed to a species described from the Ryukyu Islands, namely *Dinematichthys rinkiuensis*, now placed in the genus *Alionematchthys* (see below). Another species described above from the Thailand coast, *A. phuketensis*, across the Andaman Sea from Alcock's type locality, does not seem to attain such size and has higher dorsal (81–89) and anal (60–65) fin ray counts. Finally, Alcock's drawing is detailed enough to reveal that the holotype must be a female. With all these facts in mind it has to be considered that the specimens attributed to *A. piger* in the following and the diagnosis of the species and description are not fully satisfactory until the holotype has been re-studied.

Comparison. *Alionematchthys piger* belongs to the species group with an upper preopercular pore, large eyes and no (rarely 1 or 2) scales above the opercular spine comprising also *A. samoensis* sp. nov. and *A. suluensis* sp. nov., which both have a much more restricted distribution. It differs from *A. samoensis* sp. nov. by the lack of a knob at the distal inner end of the outer pseudoelasper and the simple flap at the anterior margin of the posterior nostril (vs strongly elevated funnel shaped). From *A. suluensis*, it differs in the anterior lobe of the inner pseudoelasper being equally long as its posterior lobe (vs very long anterior lobe, twice as long as posterior lobe) and many cirri on the snout (vs no cirri).

Distribution. *Alionematchthys piger* is one of the most common and most widely distributed Dinematichthyini (Fig. 9). Its distribution ranges from the Andaman Islands to Sumatra, Thailand, Vietnam, Taiwan and the Ryukyu

Table 6. Meristic and morphometric characters of *Alionematchthys piger* (Alcock, 1890)

	Holotype *	Holotype + 340 non-types	n
	Mean (range)		
Standard length in mm	61	50.6 (26–86)	99
Meristic characters			
Dorsal fin rays	75	79.7 (72–88)	305
Caudal fin rays	-	16.0 (14–18)	82
Anal fin rays	55	61.8 (55–70)	305
Pectoral fin rays	-	20.6 (19–22)	9
Precaudal vertebrae	-	11.1 (11–12)	340
Caudal vertebrae	-	31.1 (29–34)	337
Total vertebrae	-	42.1 (40–45)	337
Rakers on anterior gill arch	-	15.8 (13–19)	31
Pseudobranchial filaments	-	2	2
D/V	-	5.7 (5–7)	338
D/A	-	22.7 (19–28)	336
V/A	-	13.0 (12–16)	337
Morphometric characters in % of SL			
Head length	25.1	25.7 (24.0–27.5)	10
Head width	-	14.0 (11.8–15.0)	9
Head height	16.7	15.9 (13.6–16.8)	10
Snout length	-	5.8 (5.1–6.6)	9
Upper jaw length	-	13.5 (12.5–14.4)	9
Diameter of pigmented eye	2.6	2.3 (1.7–2.8)	10
Diameter of pupil	-	1.4 (0.9–1.6)	9
Interorbital width	-	7.1 (6.5–7.9)	9
Posterior maxilla height	-	4.5 (4.0–5.2)	9
Postorbital length	17.8	18.6 (17.6–19.5)	10
Preanal length	50.4	48.0 (44.4–50.9)	10
Predorsal length	31.2	30.1 (27.4–31.2)	10
Body depth at origin of anal fin	16.6	17.8 (14.8–19.5)	10
Pectoral fin length	13.9	13.5 (11.9–14.7)	10
Pectoral fin base height	5.7	6.1 (5.7–6.9)	10
Ventral fin length	-	24.0 (21.2–27.6)	9
Base ventral fin - anal fin origin	-	29.7 (25.3–34.5)	9

* Data taken from Alcock (1890 and 1905).

Islands in the north, to Australia and as far south as Lord Howe Island and eastwards to Micronesia, the Line Islands, the Tuamotu Archipelago and Pitcairn Group. Together with *Diancistrus katrineae* Schwarzahns, Møller and Nielsen, it represents the species farthest to the east in the West Pacific at Ducie Atoll. The species is found in holes and crevices of coralline and volcanic rock.

Alionematchthys plicatosurculus sp. nov.

(Figs 1, 14, 15, Tables 1, 7)

Material examined. (152 specimens, 28–79 mm SL). **HOLOTYPE** – USNM 384198, male, 79 mm SL, 10°34'45"N, 122°30'30"E, 0–4 m, small cove lined with volcanic rock and with rocky boulders in cove, volcanic rock boulders and sandy channels, coral over part of area; Guimaras Island, Pulang Duta, Sinabsapan, Panay, Philippines, J. T. Williams, D. G. Smith, K. E. Carpenter, C. Carpenter, N. Minsalan and T. Minsalan, 24 Sept. 1995. **PARATYPES** – USNM 209801, 1 male, 53 mm SL, Indonesia, Ambon, off Tandjung Suli, shallow coral reef, 0–2 m, V. G. Springer and M. F. Gomon, 11 Jan. 1973; CAS 227311, 1 female, 45 mm SL, 05°14'S, 145°47'E, Papua New Guinea, Madang, Nagada Harbour, 1–7 m, S. G. Poss, D. Catania *et al.*, 5 December 1987; USNM 365822, 2 males, 57 and 62 mm SL, Papua New Guinea, Papua, Harvey Bay, east of Oro Bay, 0–10 m, T. R. Roberts, 6–7 August 1975; USNM 365832, 1 male, 55 mm SL, 2 females, 46 and 58 mm SL, 05°11'S, 145°50'E, Papua New Guinea, Kranket Island, mangrove right up to coral, 0–1 m, V. G. Springer *et al.*, 7 Nov. 1978; USNM 366567, 1 male, 50 mm SL, Solomon Islands, Bougainville, Kieta Harbor, coral reef off main market, 1–4 m, D. M. Cohen and party, 10 Mar. 1965; USNM 366596, 1 female, 44 mm SL, 09°06'30"N, 122°55'24"E, Philippines, near Giligaon, N of Maloh, Negros, 0–2 m, L. W. Knapp *et al.* 26 April 1979; USNM 376183, 1 male, 47 mm SL, 04°14'S, 152°10'E, Papua New Guinea, Bismarck Archipelago, Rabaul, New Britain, W. Davis *et al.*, 27 Feb. 1965; USNM 394981, 3 females, 40, 52 and 62 mm SL, 1 male 48 mm SL, same data as holotype; WAM P.30635-001, 1 male, 45 mm SL, Papua New Guinea, Madang, 0–4 m, G. R. Allen *et al.*, 10 Feb. 1993; WAM P.29624-044, 5 females, 37–52 mm SL,

Table 7. Meristic and morphometric characters of *Alionematchthys plicatosurculus* sp. nov.

	Holotype	Holotype + 29 paratypes	n
	USNM 384198	Mean (range)	
Standard length in mm	79	48.9 (28-79)	30
Meristic characters			
Dorsal fin rays	77	80.3 (76-84)	28
Caudal fin rays	16	16	7
Anal fin rays	64	62.6 (60-67)	28
Pectoral fin rays	20	20.2 (19-21)	11
Precaudal vertebrae	12	12.0 (11-12)	27
Caudal vertebrae	31	31.1 (30-33)	27
Total vertebrae	43	43.1 (42-45)	27
Rakers on anterior gill arch	15	16.3 (14-18)	11
Pseudobranchial filaments	2	2	11
D/V	6	5.9 (5-6)	27
D/A	20	22.3 (19.0-25.0)	27
V/A	14	13.4 (11.0-19.0)	27
Morphometric characters in % of SL			
Head length	24.7	26.0 (24.7-28.1)	11
Head width	14.5	13.6 (11.7-15.6)	11
Head height	16.6	16.0 (13.8-17.7)	11
Snout length	5.3	5.9 (5.1-7.3)	11
Upper jaw length	13.3	13.4 (12.5-14.5)	11
Diameter of pigmented eye	2.2	2.6 (2.2-3.0)	11
Diameter of pupil	1.2	1.6 (1.2-2.2)	11
Interorbital width	7.5	7.2 (6.7-8.1)	11
Posterior maxilla height	4.5	4.4 (3.8-4.8)	11
Postorbital length	17.8	18.5 (17.6-19.2)	11
Preanal length	45.9	46.1 (43.5-47.7)	10
Predorsal length	30.4	31.3 (29.8-33.0)	11
Body depth at origin of anal fin	18.2	18.4 (17.1-19.4)	11
Pectoral fin length	13.6	13.9 (11.9-16.0)	11
Pectoral fin base height	6.0	5.9 (5.2-6.7)	11
Ventral fin length	22.0	23.5 (19.4-25.8)	14
Base ventral fin - anal fin origin	22.3	26.6 (22.3-28.5)	11

9 males, 28–52 mm SL, 05°09'S, 145°48'E, Papua New Guinea, Madang, G. R. Allen, 15 Oct. 1987.



Fig. 14. *Alionematchthys plicatosurculus* sp. nov., USNM 394198, holotype, male, 79 mm SL.

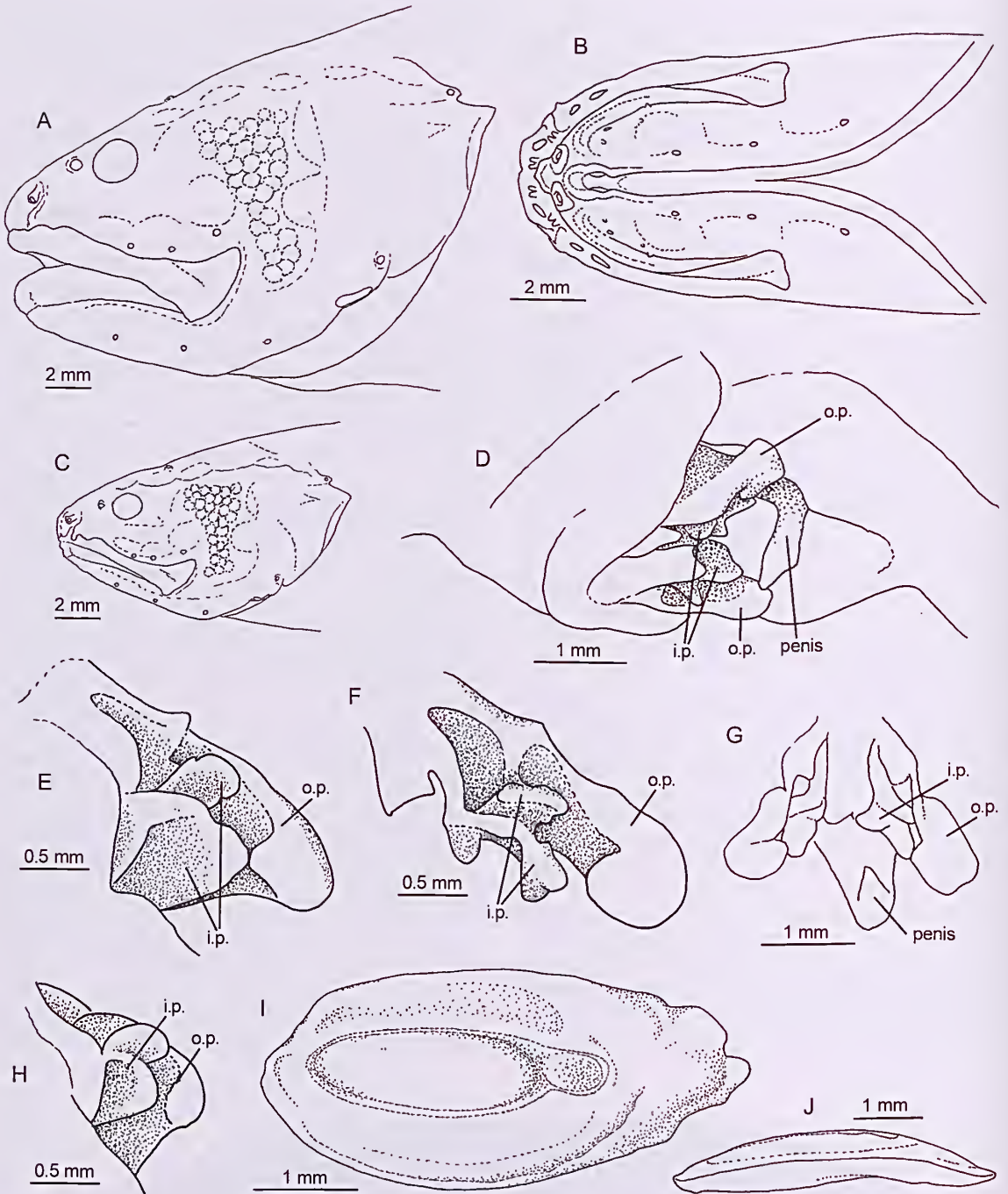


Fig. 15. *Alionematchthys plicatosurculus* sp. nov., A, lateral view of head, holotype; B, ventral view of head, holotype; C, lateral view of head, paratype, USNM 394981, female, 52 mm SL; D, inclined lateral view of male copulatory organ, holotype; E, view of left pseudoelaspers from inside, holotype; F, ventral view of left pseudoelaspers, holotype; G, ventral view of male copulatory organ, holotype; H, view of left pseudoelaspers from inside, USNM 366567, 50 mm SL; I, median view of right otolith, holotype; J, ventral view of right otolith, holotype.

Additional material. BMNH 1907.2.28.11, 1 specimen, (bad condition), Neu-Lauenburg/ Duke of York Islands, Bismarek Archipelago, Papua New Guinea; USNM 263681, 33 males and 52 females, 30–70 mm SL, 09°06'N, 122°55'E, Philippines, Negros; USNM 263683, 4 males and 9 females, 33–71 mm SL, 09°03'N, 122°59'E, Philippines, Negros; USNM 377193, 1 male and 3 females, 68–72 mm SL, 09°10'N, 123°26'E, Philippines, Siquijor Island; USNM 377202, 8 specimens, 48–71 mm SL, 10°35'N, 122°08'E, Philippines, Panay Island; USNM 345618, 5 specimens, 11°25'N, 123°15'E, Panay, Philippines; USNM 365818, 20 specimens, Papua New Guinea, Bagabag Island; USNM 366480, 1 female, 52 mm SL, 05°14'S, 145°47'E, Papua New Guinea, Madang; USNM 3766222, 1 male, 66 mm SL, 05°14'S, 145°47'E, Papua New Guinea, Madang; USNM 366508, 3 females, 40–60 mm SL, 03°23'S, 143°40'E, Papua New Guinea, Mushu Island.

Diagnosis. Vertebrae 11–12+31–33=42–45, dorsal fin rays 76–84, anal fin rays 60–67; eyes moderately large (2.2–3.0% SL); body slender, snout rounded, without cirri; scales only on cheeks; no upper preopercular pore; outer pseudoclasper broad-based, large, sometimes extending beyond hood in resting position, with thickened tip, particularly on the inner face; inner pseudoclasper large, thick, with posterior lobe folded over anterior pointed lobe; otolith length to height 2.1–2.3, with gently curved dorsal rim, otolith length to sulcus length 1.6–1.7, ostium length to cauda length 3.5–4.5.

Description (Figs 14–15). The principal meristic and morphometric characters are shown in Table 7. Mature at about 40 mm SL. Body slender, with rounded head profile. No cirri on snout.

Eye size 2.2–3.0 (2.2)% SL. Head with scale patch on cheek containing 5–6 (6) vertical rows of scales on upper part and 2–3 vertical rows on lower part. Horizontal diameter of scales on body of holotype about 1.7% SL, in 32 horizontal rows. Maxillary ending far behind eye, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end expanded, with small knob. Anterior nostril positioned high, 1/2.5–1/3 distance from upper lip to anterior margin of eye. Posterior nostril small, about 1/5 to 1/6 the size of eye. Opercular spine with free tip, thin and sharply pointed. Anterior gill arch with 14–18 (15) rakers, 3 elongate in row. Pseudobranchial filaments 2.

Head sensory pores (Fig. 15 A–C). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior), three posterior pores about one-quarter the size of three anterior pores. Mandibular pores 6 (3 anterior and 3 posterior): first anterior pore large, tubular, without cirri. Preopercular pores: 3 lower, first and second with joined opening, covered by dermal flap in lateral view; third tubular; upper preopercular pore absent. [See description of *Alionematchthys ceylonensis* for position of pores.]

Dentition (of holotype). Premaxilla with 7 outer rows of granular teeth and 1 inner row of larger teeth anteriorly. Anteriormost teeth in inner row up to 1/4 diameter of pupil.

Vomer horseshoe-shaped, with 2 outer row of small teeth and 1 inner row of large teeth up to 1/4 diameter of pupil. Palatine with 3 outer rows of small teeth and 1 inner row of long teeth up to 1/3 diameter of pupil. Dentary with 5 outer rows of granular teeth and 1 inner row of larger teeth anteriorly, up to about 1/2 diameter of pupil.

Otolith (Fig. 15I, J). Moderately elongate in shape, length to height 2.1–2.3 and thin (otolith height to otolith thickness about 3). Anterior tip broadly rounded to slightly angular, posterior tip much expanded and slightly ornamented. Dorsal rim gently curved, without distinct angles. Inner face moderately convex, outer face concave to almost flat, both smooth. Otolith length to sulcus length 1.6–1.7. Sulcus slightly supramedially positioned, slightly inclined, with separated colliculi and marked notch at ventral rim of sulcus at joint of ostium with cauda. Ostium length to cauda length 3.5–4.5. Ventral furrow feeble and close to ventral rim of otolith.

Axial skeleton. Neural spine of vertebra 4 inclined and 5–8 depressed. Parapophyses present from vertebrae 6 to 11 (12). Pleural ribs on vertebrae 2 to 10 (11). First anal fin pterygiophore slightly longer than subsequent pterygiophore.

Male copulatory organ (Fig. 15D–H). Two pairs of moderately large pseudoclaspers. Outer pseudoclasper large, sometimes extending beyond hood in resting position, with thickened tip (particularly in large specimens) expressed as massive knob on inner face; inner pseudoclasper large, thick, with posterior lobe very large and folded over anterior pointed lobe. Isthmus moderately narrow; penis curved, about as long as outer pseudoclaspers.

Colour. Live colour unknown. Preserved colour uniformly brownish.

Comparison. *Alionematchthys plicatosurculus* belongs to the species group without an upper preopercular pore together with *A. ceylonensis*, *A. phuketensis* and *A. shinoharai* sp. nov., from which it differs in the peculiar shape of the thick inner pseudoclasper with the posterior lobe folded over the anterior lobe and the massive tip of the inner face of the outer pseudoclasper. For further distinction from *A. ceylonensis* and *A. phuketensis* see respective descriptions. From *A. shinoharai* sp. nov. it differs further in the lack of scales above the opercular spine (vs 2), the long sulcus (otolith length to sulcus length 1.5–1.6 vs 1.9–2.0) and the notch at the ventral sulcus margin at the joint of ostium and cauda (vs no notch).

Distribution. *Alionematchthys plicatosurculus* is known from the Philippines south of 12°N, Ambon and along the northern coast of New Guinea to the Bismarek Archipelago and Solomon Islands (Fig. 1).

Etymology. Named after the characteristic folded inner pseudoclasper by a combination of *plicatus* (Latin = folded) and *surculus* (Latin = grapevine tendril) used for the term pseudoclasper. It is a noun in apposition.



Fig. 16. Sample sites of ① *Alionemachthys riukiensis* (Aoyagi, 1954), * *Alionemachthys* aff. *riukiensis* 1, ★ *Alionemachthys* aff. *riukiensis* 2, ② *A. samoensis* sp. nov., ③ *A. winterbottomi* sp. nov., ① *Alionemachthys* sp. 1, ② *Alionemachthys* sp. 2. One symbol may represent several samples.

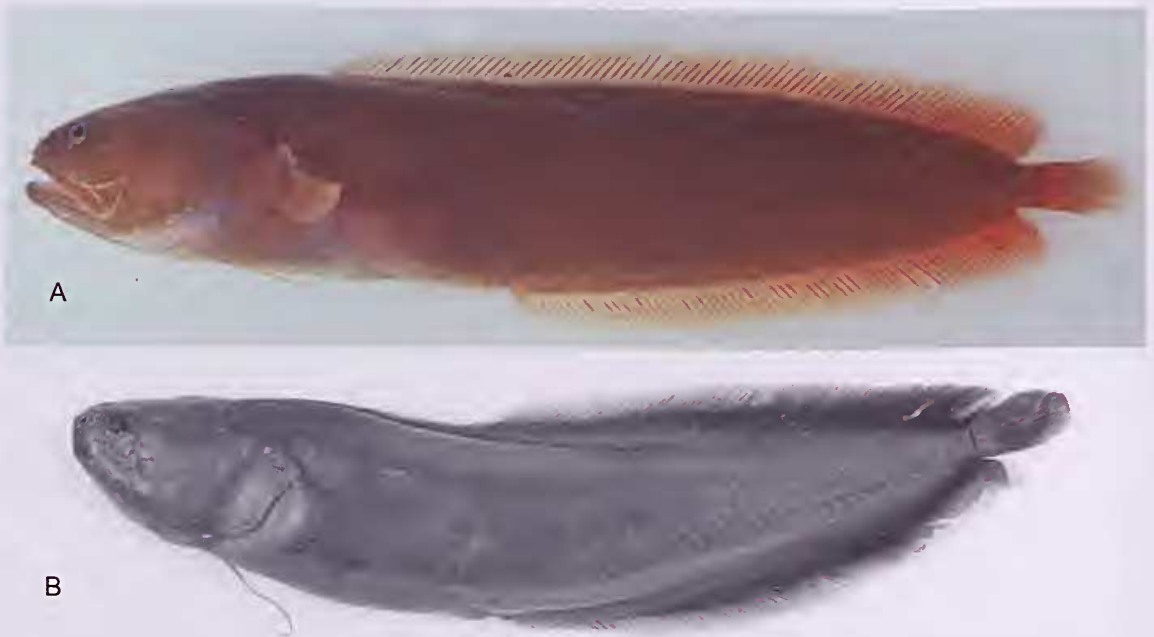


Fig. 17. *Alionemachthys riukiensis* (Aoyagi, 1954), A, fresh dead, WAM P.30909-002 [exact specimen and size not known], B, NMST-P 55637, male, 74 mm SL.

Aliouematichthys riukinensis (Aoyagi, 1954)

(Figs 16–19, Tables 1, 8)

Dinematichthys riukiuensis Aoyagi, 1954: 235; Machida 1992: 270; Machida 1994: 461; Hayashi 1995: 11; Nielsen *et al.* 1999: 130.

Brotulina fusca. — Matsubara 1955: 800 (not *Diancistrus fuscus* Fowler, 1946).

Dinematichthys megasoma Machida, 1994: 459; Nielsen *et al.* 1999: 130; Schwarzhans and Möller 2005: 78.

Material examined. 536 specimens, 19–150 mm SL. **PARALECTOTYPE** – YCM-P 30001, female, 72 mm, Okinawa Island, Ryukyu Islands; **NON-TYPES** – AMS I.37399-076, male, 73 mm SL, Vanuatu; AMS I.18739-037, 1 male and 2 females, 14°42'S, 145°27'E, Lizard Island, Queensland, Australia; AMS I.19108-032, 2 males and 3 females, 14°40'S, 145°28'E, Lizard Island, Great Barrier

Table 8. Meristic and morphometric characters of *Aliouematichthys riukiuensis* (after Aoyagi 1954).

	Holotype YCM-P 30023*	Holotype + non-types Mean (range)	n
Standard length in mm	90	72.3 (20-148)	121
Meristic characters			
Dorsal fin rays	79	83.9 (77-92)	107
Caudal fin rays	16	15.7 (14-16)	40
Anal fin rays	61	65.1 (59-72)	107
Pectoral fin rays	22	20.5 (19-23)	11
Precaudal vertebrae	11	11.3 (11-12)	121
Caudal vertebrae	31	31.5 (29-33)	120
Total vertebrae	42	42.8 (41-44)	120
Rakers on anterior gill arch	-	19.1 (15-21)	10
Pseudobranchial filaments	-	1.9 (0-3)	9
D/V	-	5.7 (5-7)	111
D/A	-	23.7 (19-27)	112
V/A	-	13.1 (12-14)	112
Morphometric characters in % of SL			
Head length	29.3	26.8 (25.7-29.3)	12
Head width	-	14.8 (11.6-18.6)	11
Head height	-	17.1 (14.3-20.5)	11
Snout length	7.3	5.8 (4.7-7.3)	12
Upper jaw length	14.3	13.9 (12.4-15.1)	11
Diameter of pigmented eye	3.0	2.6 (2.5-3.0)	12
Diameter of pupil	-	1.4 (1.2-1.6)	10
Interorbital width	7.7	7.3 (6.2-8.0)	11
Posterior maxilla height	5.3	4.6 (3.8-5.3)	11
Postorbital length	20.6	19.5 (19.0-20.6)	12
Precanal length	49.8	47.1 (45.7-49.8)	11
Predorsal length	33.0	31.2 (29.9-33.0)	11
Body depth at origin of anal fin	21.4	19.9 (16.8-23.4)	11
Pectoral fin length	15.7	14.4 (12.8-16.1)	10
Pectoral fin base height	7.5	6.1 (4.4-7.5)	11
Ventral fin length	20.4	21.6 (20.0-24.8)	12
Base ventral fin - anal fin origin	-	26.5 (21.8-30.9)	10

* Data from Machida (1994) included.

Reef, Australia, 1–10 m, D. F. Hoese and party, 17 Nov. 1975; AMS I.20770-015, 42 specimens, 11°55'S, 143°27'E, Sir Charles Hardy Island, Queensland, Australia; AMS I.20770-073, 11 specimens, 11°55'S, 143°27'E, Sir Charles Hardy Island, Queensland, Australia; AMS I. 21422-029, 5 specimens, 14°S, 145°E, Coral Sea; AMS I.33740-026, 1 male, 10°S 144°E, Coral Sea; AMS I.34311-010, 1 male, 5 females, 22°14'S, 150°19'E, Australia, Queensland, Cannibal Group; AMS I.37315-032, 3 males and 4 females, 18°44'S, 169°12'E, Vanuatu, Erromango; AMS I.37322-009, 4 females, 19°31'S, 169°29'E, Vanuatu, Tanna; AMS I.37339-076, 1 male and 1 female, 16°47'S, 168°21'E, Vanuatu, Epi; AMS I.37922-021, 1 male, and 1 female, 13°52'S, 167°32'E, Vanuatu, Banks Islands; BPBM 5921, 1 female, Vanuatu, Efate; BPBM 11465, 2 females, New Caledonia; BPBM 40934, 1 male, 2 females, Ryukyu Islands; BPBM 40936, 2 females, Similan Island Thailand; CAS 65664, 1 male, Papua New Guinea, Madang; KAUM-I. 11459, 1 male, 61 mm SL, 30°27'23"N, 130°29'59"E, Issu, Yakushima Island, Kagoshima, Japan; KAUM-I. 10661, 1 male, 48 mm SL, off Okinoerabu Island, Kagoshima, Japan; KAUM-I. 11484, 1 male, 55 mm SL, 30°27'23"N, 130°29'59"E, Issu, Yakushima Island, Kagoshima, Japan; KSHS 3650 (otolith only); MNHN 1980-0851, 3 females, New Caledonia; NSMT-P 55636, female 74 mm SL, China, Hainan Island, China; NSMT-P 55637, 1 male, 74 mm SL, Hainan Island, China; NTM S.13425-007, 1 female, 11°58'S, 123°21'E, Ashmore Islands, Australia; ROM 71841, 9 specimens, Vietnam; ROM 71843, 11 specimens, Vietnam; ROM 71850, 5 specimens, 20°N 107°E; SMNS 26429, 5 specimens, eastsoutheast of Thio, New Caledonia, 21°38'57"S, 166°18'31"E, 0–8.5 m; SMNS 26430, 6 specimens, Maré, Cap Wabao, Loyalty Islands, 21°35'45"S 167°50'06"E, 2–3.8 m; SMNS 22705, 6 specimens, northnorthwest of Ouégoa, New Caledonia, 20°15'20"S, 164°24'10"E, 0.5–3.5 m; SMNS 22804, 5 specimens, east-south-east of Ponérihuen, New Caledonia, 21°04'55"S 165°28'10"E, 0.3–2.8 m; SMNS 26431, 2 specimens, north-west of Hienghène, New Caledonia, 20°31'49"S 164°47'01"E, 0.2–3.5 m; USNM 199541, 9 males and 14 females, 42–66 mm SL, 04°01'S, 101°01'E, Mentawai, Sumatra; USNM 394978, 5 specimens, 21°N 120°E; EX USNM 345618, 7 males, 29–65 mm SL, 1 female, 40 mm SL, juvenile 20 mm SL, 11°25'N, 123°15'E, Panay, Philippines; USNM 394982, 31 specimens, 16°47'S, 168°21'E, Epiu, Vanuatu; USNM 355385, 38 specimens, Tanna, Vanuatu; USNM 394984, 1 female, 75 mm SL, 17°31'S, 168°19'E, Efate, Vanuatu; USNM 362434, 1 male, 64 mm SL, 3 females, 4 juveniles, 14°S 167°E, Banks Islands, Vanuatu; USNM 366490, 3 males, 72–78 mm SL, 3 females, 57–72 mm SL, 08°29'N, 97°39'E, Similan Islands, Thailand; USNM 366600, 1 male, 62 mm SL, 09°19'N, 123°18'E, Negros, Philippines; USNM 376188, 1 male, 150 mm SL, 2 females, 116–119 mm SL, Taiwan; WAM P.30305-037, 1 male, 2 females, 13°52'S, 126°56'E, Sir Graham Moore Islands, Western Australia;

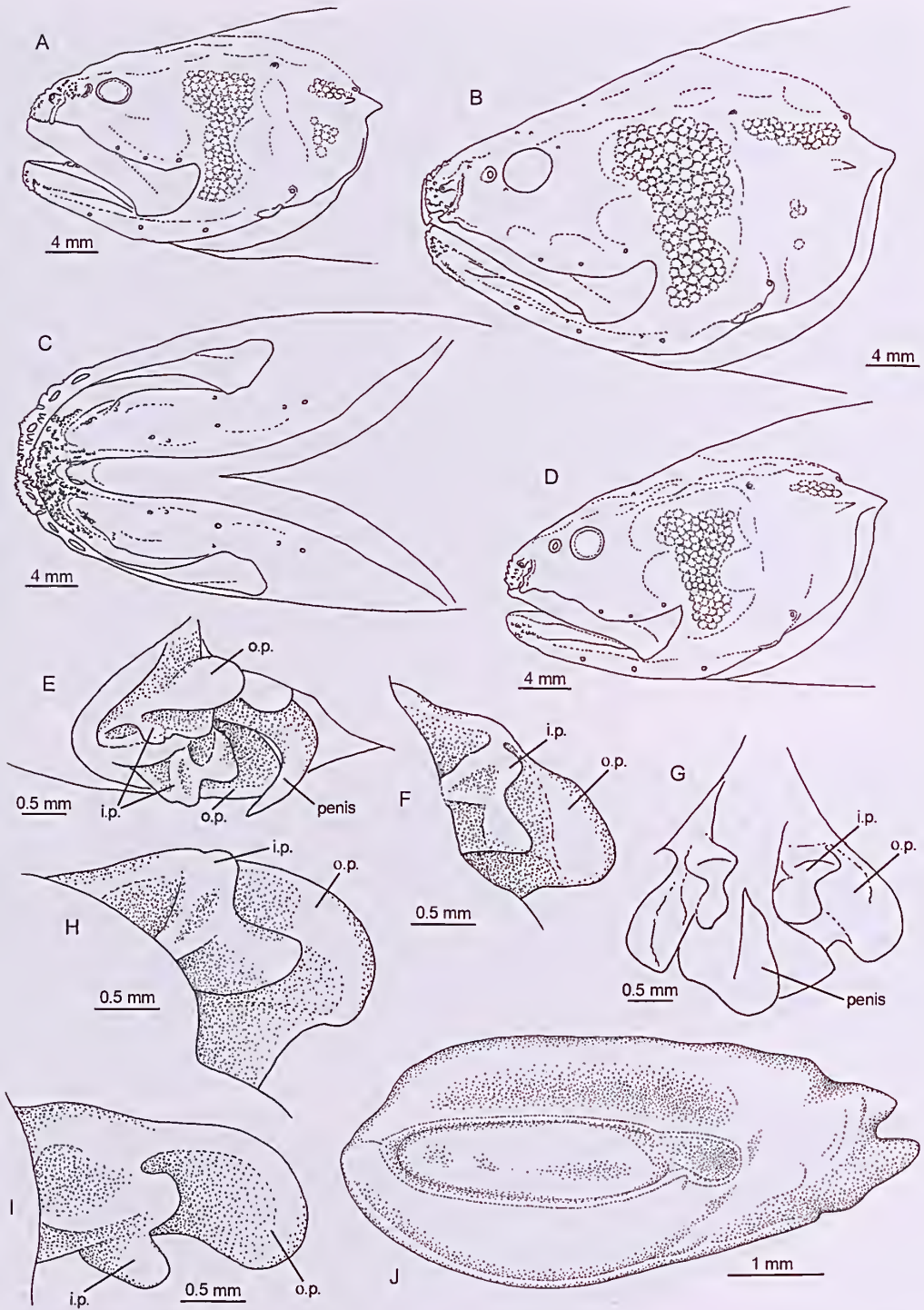


Fig. 18. *Alionemataichthys riukuensis* (Aoyagi, 1954), A, lateral view of head, ROM 71841, male, 73 mm SL; B, lateral view of head, WAM P.30308-001, male, 112 mm SL; C, ventral view of head, WAM P.30308-001, male, 112 mm SL; D, lateral view of head, AMS I.34311-010, female, 69 mm SL; E, inclined lateral view of male copulatory organ, USNM 394982, 92 mm SL; F, view of left pseudoclaspers from inside, USNM 394982, 92 mm SL; G, ventral view of male copulatory organ, SMNS 26430, 130 mm SL; H, view of left pseudoclaspers from inside, USNM 376188, 150 mm SL; I, ventral view of left pseudoclaspers, WAM P.30308-001, 112 mm SL; J, median view of right otolith, WAM P.30308-001, 112 mm SL.

WAMP.30308-001, 7 specimens, 13°S, 125°E, Timor Sea; WAMP.30909-002, 8 specimens, 16°S, 123°E, North West Australia; YCM-P44101, 1 male and 2 females, Ishigaki, Ryukyu Islands; YCM-P44102, 3 specimens, Kakeroma Island, Ryukyu Islands.

Additional material. USNM 151418, 1 male, 59 mm SL, Philippines; USNM 151420, 1 male, 74 mm SL, Philippines; USNM 151422, 1 female 73 mm SL, Philippines; USNM 151423, 1 female, 82 mm SL, Philippines; USNM 151424, 1 male, 84 mm SL, Philippines; USNM 151425, 1 female, 102 mm SL, Philippines; USNM 151426, 1 female, 50 mm SL, Philippines; USNM 164589, 1 female, 78 mm SL, Espiritu Santo, Vanuatu; USNM 376160, 1 male and 3 females, 62–70 mm SL, Taiwan; USNM 377258, 15 specimens, 38–83 mm SL, 02°35'S, 150°47'E, Kavieng, New Ireland, Papua New Guinea; USNM 263666, 5 males and 9 females, 34–83 mm SL, 16°25'N, 119°54'E, Luzon, Philippines; USNM 263680, 2 males, 59–109 mm SL, 23°29'S, 152°05'E, One Tree Island, Queensland, Australia; USNM 377214, 25 specimens, 47–109 mm SL, 09°06'N, 122°55'E, Negros, Philippines; USNM 376347, 1 female, 61 mm SL, 10°52'N, 120°56'E, Palawan, Philippines; USNM 376225, 1 female, 49 mm SL, 10°55'N, 121°02'E, Palawan, Philippines; USNM 263700, 1 male, 68 mm SL, 09°04'N, 123°16'E, Apo Island, Philippines; USNM 263743, 5 specimens, 34–76 mm SL, Milne Bay, Papua New Guinea; USNM 263755, 15 specimens, 31–119 mm SL, Taiwan; USNM 377208, 1 male and 3 females, 79–104 mm SL, 10°35'N, 122°08'E, Panay, Philippines; USNM 376163, 6 females, 68–92 mm SL, 18°44'S, 169°12'E, Erromango, Vanuatu; USNM 355152, 1 female, 100 mm SL, 17°03'S, 168°21'E, Emae, Vanuatu; USNM 356612, 10 specimens, 19–95 mm SL, Tomotu, Santa Cruz Islands, Solomon Islands; USNM 376167, 3 females, 35–51 mm SL, 13°32'S, 167°20', Banks Islands, Vanuatu; USNM 363192, 1 male and 1 female, 33–75 mm SL, Banks Islands, Vanuatu; USNM 376166, 3 females, 30–88 mm SL, 13°04'S, 167°39'E, Banks Islands, Vanuatu; USNM 365819, 7 specimens, 44–72 mm SL, Bagabag Island, Papua New Guinea; USNM 376223, 2 males and 4 females, 55–80 mm SL, 05°14'S, 145°47'E, Madang, Papua New Guinea; USNM 366482, 16 males and 39 females, 32–75 mm SL, 10°47'S, 152°24'E, Louisiade Archipelago, Deboyne Atoll, Papua New Guinea; USNM 376202, 1 female, 55 mm SL, 05°14'S, 145°47'E, Madang, Papua New Guinea; USNM 376190, 1 female, 65 mm SL, 05°14'S, 145°47'E, Madang, Papua New Guinea; USNM 366521, 10 specimens, 32–80 mm SL, 05°10'S, 145°51'E, Kranket Island, Papua New Guinea; USNM 366522, 2 males and 1 female, 40 mm SL, 01°31'S, 145°01'E, Hermit Islands, Papua New Guinea; USNM 366524, 1 male, 67 mm SL, 05°14'S, 145°47'E, Madang, Papua New Guinea; USNM 366557, 1 male and 1 female, 51–73 mm SL, 21°55'N, 120°44'E, Taiwan; USNM 366559, 1 female, 56 mm SL, Taiwan; USNM 374226, 6 specimens, 35–103 mm SL, Taiwan; USNM 366576, 1 female, 52 mm SL, 01°12'S, 144°16'E, Ninigo

Atoll, Papua New Guinea; USNM 376173, 3 males and 3 females, 64–104 mm SL, 23°29'S, 152°05'E, One Tree Island, Queensland, Australia; USNM 376171, 1 male and 1 female, 63 mm SL, 23°25'S, 151°55'E, Heron Island, Queensland, Australia; USNM 366682, 1 female, 82 mm SL, 23°25'S, 151°55'E, Heron Island, Queensland, Australia; USNM 366688, 1 male, 38 mm SL, Taiwan; USNM 366693, 7 specimens, 21–82 mm SL, Taiwan.

Tentatively assigned specimens (*A. aff. riukiuensis*). BPBM 40938, 5 males and 2 females, Taiwan; USNM 309643, 3 males and 3 females, 40–60 mm SL, 04°52'N, 119°26'E, Sibutu Island, Philippines.

Diagnosis. Vertebrae 11–12+30–32=41–44, dorsal fin rays 77–92 (average 84), anal fin rays 59–72 (average 65); eyes moderately large (2.5–3.0% SL); body moderately slender, massive, snout with many cirri; scales on cheeks and large scale patch above opercular spine (6–17), large specimens with few scales also below opercular spine; upper preopercular pore present; outer pseudoclasper broad-based, not very large, not extending beyond hood in resting position; inner pseudoclasper not much smaller than outer pseudoclasper, anterior and posterior lobes of equal size, anterior lobe broadly connected to anterior rim of outer pseudoclasper; otolith slender, length to height 2.2–2.4, with gently curved dorsal rim, otolith length to sulcus length 1.6–1.7, ostium length to cauda length 3.5–4.0.

Description (Figs 17–19). The principal meristic and morphometric characters are shown in Table 8. One of the largest species attaining up to 150 mm SL; mature at about 50–55 mm SL. Body moderately slender, massive, with moderately pointed head profile. Many cirri on snout. Eye size 2.5–3.0 (3.0)% SL. Head with scale patch on cheek containing 8–13 vertical rows of scales on upper part and 4–5 vertical rows on lower part, scale patch above opercular spine with 6–17 scales, in adults, scaled patch below opercular spine with up to 8 scales. Horizontal diameter of scales on body of a 74 mm SL male, about 1.5% SL, in about 40 horizontal rows. Maxillary ending far behind eye, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end expanded with small knob. Anterior nostril positioned high, 1/2–2.5 distance from upper lip to anterior margin of eye. Posterior nostril small, about 1/6 to 1/8 the size of eye. Opercular spine with free tip, pointed. Anterior gill arch with 15–21 rakers, 3 elongate. Small plate-like raker between lower two elongate rakers in most specimens. Pseudobranchial filaments 0–3 (usually 2).

Head sensory pores (Fig. 18A–D). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior), three posterior pores about one-third size of three anterior pores. Mandibular pores 6 (3 anterior and 3 posterior): first anterior pore large, tubular, with cirri. Preopercular pores: 3 lower, first and second with joined opening, covered by dermal flap in lateral view; third tubular; upper preopercular pore present. [See description of *Alionematichthys ceylonensis* for position of pores.]

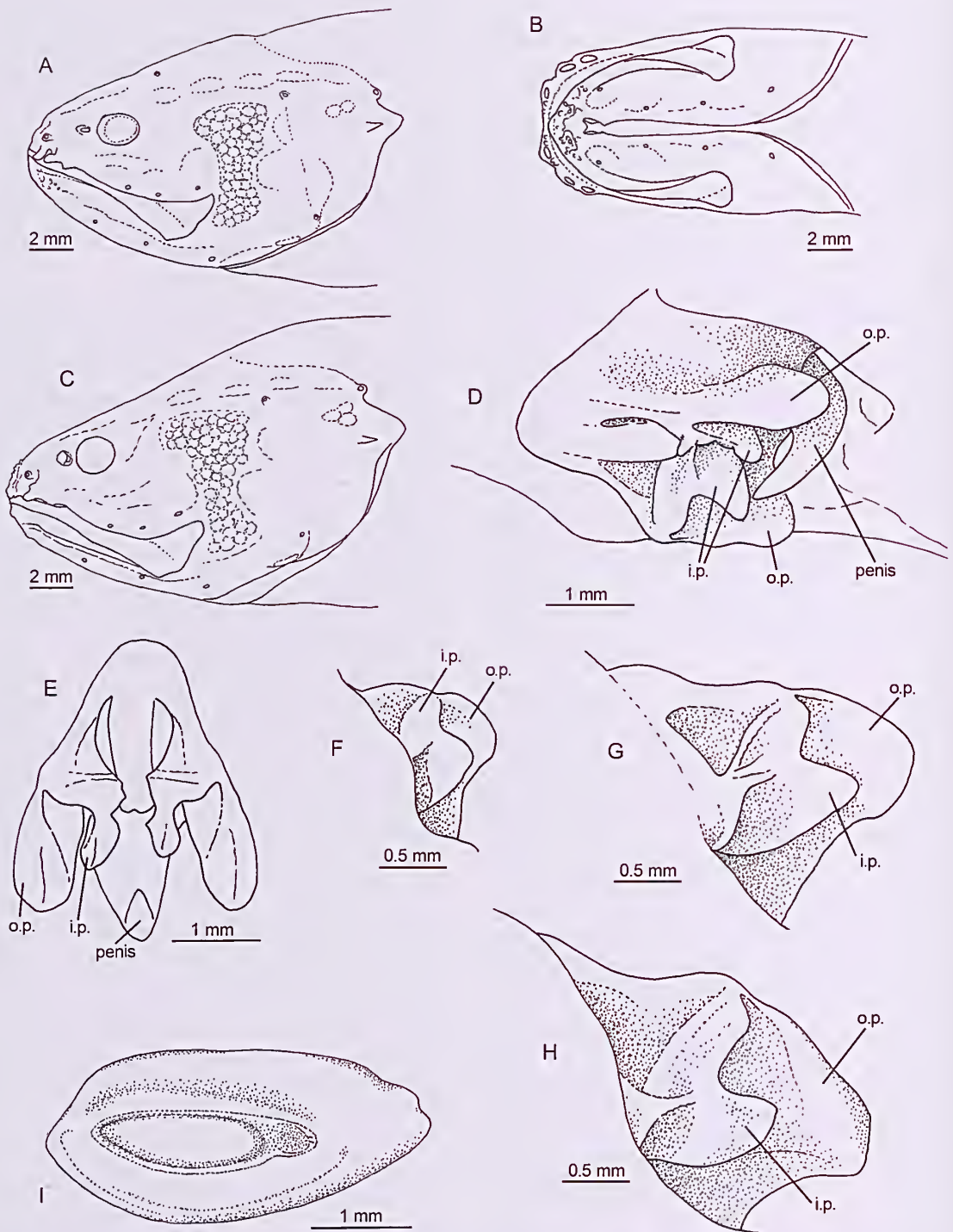


Fig. 19. *Alionemachthys* aff. *riukuensis* (Aoyagi, 1954), A, lateral view of head, BPBM 40938, male, 62 mm SL; B, ventral view of head, BPBM 40938, male, 62 mm SL; C, lateral view of head, USNM 309643, male, 58 mm SL; D, inclined lateral view of male copulatory organ, BPBM 40938, male, 80 mm SL; E, ventral view of male copulatory organ, BPBM 40938, male, 80 mm SL; F, view of left pseudoclaspers from inside, USNM 309643, 58 mm SL; G, view of left pseudoclaspers from inside, BPBM 40938, male, 62 mm SL; H, view of left pseudoclaspers from inside, BPBM 40938, male, 80 mm SL; I, median view of right otolith, USNM 309643, male, 58 mm SL.

Dentition (of a 74 mm SL male, NSMT-P 55637). Premaxilla with 6 outer rows of granular teeth and 2 inner rows of larger teeth anteriorly. Anteriormost teeth in inner row up to 1/2 diameter of pupil. Vomer horseshoe-shaped, with 6 outer rows of small teeth and 1 inner row of large teeth up to 1/4 diameter of pupil. Palatine with 4 outer rows of small teeth and 1 inner row of long teeth up to 1/4 diameter of pupil. Dentary with 6 outer rows of granular teeth and 1 inner row of larger teeth anteriorly, up to about 1/2 diameter of pupil.

Otolith (Fig. 18J). Elongate in shape, length to height 2.2–2.4 and thin (otolith height to otolith thickness about 3). Anterior tip slightly pointed, posterior tip pointed, expanded and irregularly ornamented. Dorsal rim gently curved, without distinct angles. Inner face moderately convex, outer face slightly concave to almost flat, both smooth. Otolith length to sulus length 1.6–1.7. Sulus medianly positioned, not inclined, with separated colliculi and marked notch at ventral rim of sulcus at joint of ostium with cauda. Ostium length to cauda length 3.5–4.0. Ventral furrow distinct and close to ventral rim of otolith.

Axial skeleton. Neural spine of vertebra 4 inclined and 5–8 depressed. Parapophyses present from vertebrae 6 to 11 (12). Pleural ribs on vertebrae 2 to 11 (12). First anal fin pterygiophore not or only slightly longer than subsequent pterygiophore.

Male copulatory organ (Fig. 18E–I). Two pairs of rather small pseudoclasps, not extending beyond hood in resting position. Outer pseudoclasps a broad based flap; inner pseudoclasps slightly shorter, very thick (best seen in ventral view: Fig. 18G), with anterior pointed lobe broadly connected by ligament to anterior rim of outer pseudoclasps, posterior lobe broad, about equal in size. Isthmus moderately narrow; penis curved, slightly longer than outer pseudoclasps.

Colour. Live colour brownish-red or orange-brown (SMNS 22804), sometimes with yellowish vertical fins (Fig. 17A). Preserved colour medium to dark brown.

Variability. *Alionematichthys riukuensis* shows some variation in the number of scales on the opercle above and below the opercular spine and a certain variation of the dorsal and anal fin ray counts, both of which does not seem to follow a geographic pattern.

Remarks. Machida (1994) described *Dinematichthys megasoma* from Australia. These specimens agree well with the variability observed in *A. riukuensis*, including the characters regarded by Machida as distinctive from *Dinematichthys riukuensis*, i.e. the short tubular posterior nostril, the widely scaled opercle and the lateral scale row counts. We have, however, observed two specific lots which somewhat depart from the general range of variability (see Fig. 19). They are both notable for few or no cirri on the snout and few scales above the opercular spine (2–6) (Fig. 19A–C). They vary amongst themselves in meristics (see Table 1, 8). Their pseudoclasps resemble those of *A. riukuensis* (Fig. 19D–H) perfectly as do their otoliths

(Fig. 19I). Due to the limited amount of specimens available and the high degree of similarity with *A. riukuensis* they are here referred to as *Alionematichthys* aff. *riukuensis*.

Comparison. *Alionematichthys riukuensis* belongs to the species group with an upper preopercular pore, large eyes and (many) scales above the opercular spine and cirri on the snout (comprising also *A. winterbottomi* sp. nov.). It differs mainly in the characters of the pseudoclasps and the presence of scales below the opercular spine in adults (vs always absent in *A. winterbottomi* sp. nov.). It differs from *A. piger* and *A. samoensis* sp. nov., which likewise show many cirri on the snout in the presence of many scales above the opercular spine (vs none or rarely 1–2) and the pseudoclasps morphology. Also, *A. riukuensis* is notable for the large size it can attain and at which it matures, greater than in all other species of *Alionematichthys*.

Distribution. *Alionematichthys riukuensis* is widely distributed in the Indo-west Pacific from the Ryukyu Islands, Hainan Island and the west coast of Thailand in the north to the northern shores of Australia, New Caledonia and Vanuatu in the south (Fig. 16).

Alionematichthys samoensis sp. nov.

(Figs 16, 20, 21, Tables 1, 8)

Material examined. (36 specimens, 22–59 mm SL). HOLOTYPE – CAS 81486, male, 46 mm SL, ca. 11°03'S, 171°04'W, seaward face of leeward reef on Swains Island, American Samoa, coll. L. R. Taylor Jr., 23 May 1967. PARATYPES – AMS IB. 6513, male, 54 mm SL, 14°27'S, 178°05'W, Alofi, Niue, W. N. McDowall, May 1963; BPBM 24122, 2 females, 56 and 59 mm SL, Samoa, Tutuila, R. C. Wass, 1976–1977; CAS 227305, 20 females, 22–53 mm SL, 11 males, 25–47 mm SL, juvenile, 22 mm SL, same data as holotype.

Diagnosis. Vertebrae 11–12+29–31=40–43, dorsal fin rays 73–80, anal fin rays 57–64; eyes moderately large (2.2–2.8% SL); body slender, snout with many cirri; scales on cheeks, no scales above opercular spine; upper preopercular pore present; posterior nostril funnel-shaped; outer pseudoclasps broad-based, not extending beyond hood in resting position, with thick distal knob on inner face; inner pseudoclasps about half size of outer pseudoclasps, anterior thorn slightly bent, posterior lobe broader than anterior thorn.

Description (Figs 20, 21). The principal meristic and morphometric characters are shown in Table 9. Body moderately slender, with moderately pointed head profile. Many cirri on snout. Eye size 2.2–2.8 (2.2)% SL. Head with scale patch on cheeks containing 6–7 vertical rows of scales on upper part and 2–3 vertical rows on lower part, no scale patch on opercle. Horizontal diameter of scales on body in holotype 1.7% SL, in about 24 horizontal rows. Maxillary ending far behind eye, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end expanded. Anterior nostril positioned high, one-half distance from upper lip to anterior margin of eye. Posterior nostril with



Fig. 20. *Alionematchthys samoensis* sp. nov., CAS 81486, holotype, male, 46 mm SL.

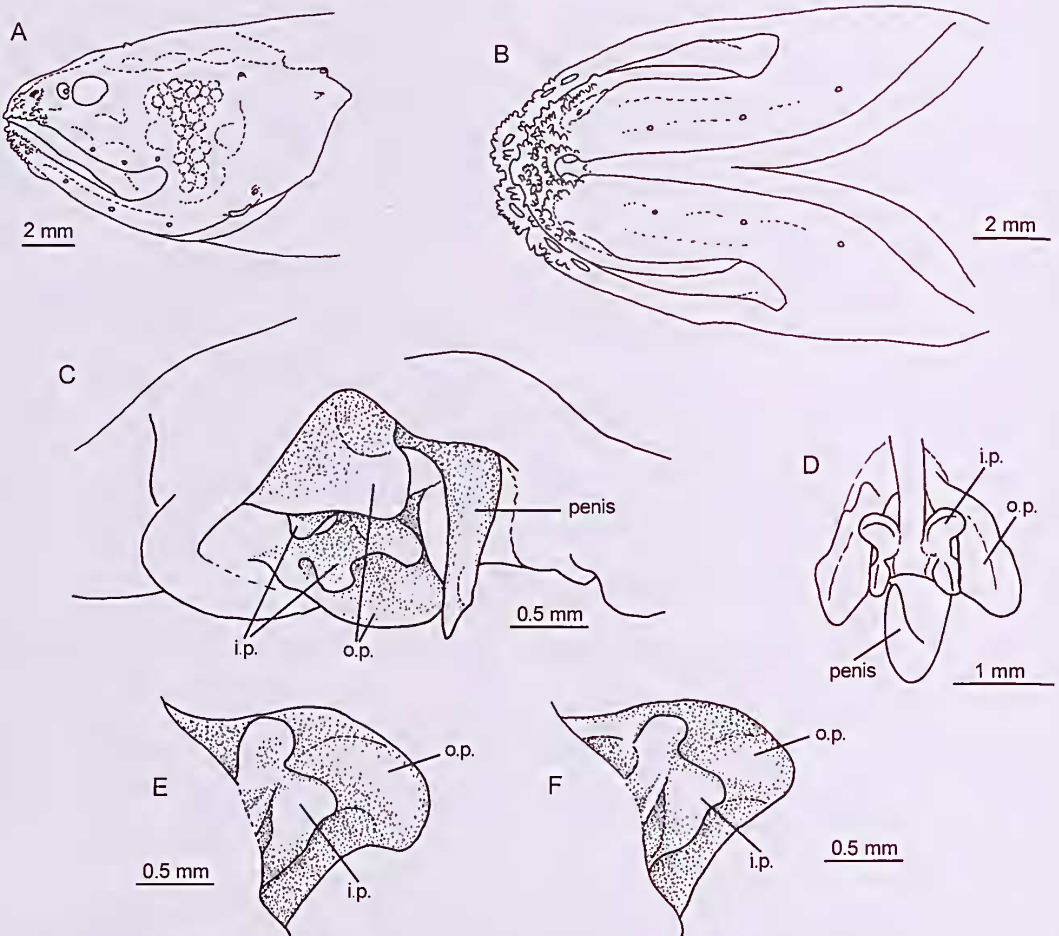


Fig. 21. *Alionematchthys samoensis* sp. nov., A, lateral view of head, holotype; B, ventral view of head, holotype; C, inclined lateral view of male copulatory organ, CAS 81486, male, 39 mm SL; D, ventral view of male copulatory organ, holotype; E, view of left pseudoclaspers from inside, holotype; F, view of left pseudoclaspers from inside, CAS 81486, 39 mm SL.

broad funnel-shaped rim, about one-eighth the size of eye. Opercular spine with free tip, pointed. Anterior gill arch with 14–18 (15) rakers, 3 elongate. In holotype and a few paratypes lower two elongate rakers interrupted by one plate-like raker. In other paratypes, three elongate rakers in row. Pseudobranchial filaments 1–2 (usually 2).

Head sensory pores (Fig. 21A, B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior), three posterior pores about one-third the size of three anterior pores. Mandibular pores 6 (3 anterior and 3 posterior): first anterior pore large, tubular, with cirri. Preopercular pores: 3 lower, first and second with joined opening, covered by

Table 9. Meristic and morphometric characters of *Alionematchthys samoensis* sp. nov.

	Holotype CAS 81486	Holotype + 35 non-types	n
		Mean (range)	
Standard length in mm	46	37.3 (22-59)	36
Meristic characters			
Dorsal fin rays	76	76.6 (73-80)	33
Caudal fin rays	16	16.1 (16-17)	24
Anal fin rays	59	59.4 (57-64)	33
Pectoral fin rays	22	21.6 (20-22)	12
Precaudal vertebrae	12	11.2 (11-12)	33
Caudal vertebrae	30	30.7 (29-31)	33
Total vertebrae	42	41.9 (40-43)	33
Rakers on anterior gill arch	15	15.6 (14-18)	12
Pseudobranchial filaments	2	1.9 (1-2)	10
D/V	5	5.6 (5-6)	33
D/A	23	22.6 (20-26)	33
V/A	13	13.2 (13-14)	33
Morphometric characters in % of SL			
Head length	27.2	27.2 (26.2-28.9)	10
Head width	14.2	13.8 (11.8-16.2)	10
Head height	16.4	16.6 (15.3-17.9)	10
Snout length	5.5	6.1 (5.5-6.5)	9
Upper jaw length	14.7	14.3 (13.3-15.6)	10
Diameter of pigmented eye	2.2	2.5 (2.2-2.8)	9
Diameter of pupil	1.4	1.4 (1.2-1.5)	9
Interorbital width	7.8	7.6 (7.2-8.0)	10
Posterior maxilla height	4.7	4.7 (3.9-5.3)	10
Postorbital length	19.8	19.4 (18.5-21.2)	10
Preal length	48.7	47.7 (44.8-50.4)	10
Predorsal length	30.7	31.1 (28.9-32.5)	10
Body depth at origin of anal fin	19.4	18.8 (16.3-20.4)	10
Pectoral fin length	13.4	13.5 (12.7-15.7)	10
Pectoral fin base height	6.5	6.6 (6.2-6.8)	10
Ventral fin length	26.0	25.5 (22.5-27.1)	10
Base ventral fin - anal fin origin	29.6	28.3 (25.8-31.6)	10

dermal flap in lateral view; third tubular; upper preopercular pore present. [See description of *Alionematchthys ceylonensis* for position of pores.]

Dentition (of holotype). Premaxilla with 5 outer rows of granular teeth and 1 inner row of larger teeth anteriorly. Anteriormost teeth in inner row up to 1/3 diameter of pupil. Vomer horseshoe-shaped, with 2 outer rows of small teeth and 1 inner row of large teeth up to 1/3 diameter of pupil. Palatine with 1 outer row of small teeth and 1 inner row of long teeth up to 1/3 diameter of pupil. Dentary with 5 outer rows of granular teeth and 1 inner row of larger teeth anteriorly, up to about 2/3 diameter of pupil.

Otolith (not known).

Axial skeleton. Neural spine of vertebra 4 inclined and 5-8 depressed. Parapophyses present from vertebrae 6 to 11 (12). Pleural ribs on vertebrae 2 to 10-11 (12). First anal fin pterygiophore not or only slightly longer than subsequent pterygiophore in females, much longer in males, but not reaching last precaudal parapophysis.

Male copulatory organ (Fig. 21C-F). Two pairs of rather small pseudoclaspers, not extending beyond hood in resting position. Outer pseudoclasper a broad based flap, with thick knob distally on inner face, its supporter somewhat bent backward at tip; inner pseudoclasper thick, about half the size of outer pseudoclasper, anterior lobe slightly bent, posterior lobe broader than anterior thorn. Isthmus narrow; penis curved, slightly longer than outer pseudoclaspers.

Colour. Live colour unknown. Preserved colour uniformly light brown.

Comparison. *Alionematchthys samoensis* belongs to the species group with an upper preopercular pore, large eyes and no scales above the opercular spine, comprising also *A. piger* and *A. suhuensis* sp. nov. *Alionematchthys samoensis* obviously is closely related to *A. piger*, which it replaces in region of Samoa, differing mainly in the distinct knob on the inner face of the outer pseudoclasper (vs thin outer pseudoclasper without knob) and the funnel-shaped posterior nostril (vs anterior rim elevated only). From *A. suhuensis*, it differs readily in the presence of many delicate cirri on the snout (vs absent) and the anterior lobe of the inner pseudoclasper being as long as its posterior lobe (vs twice as long).

**Fig. 22.** *Alionematchthys shinoharai* sp. nov., NSMT-P 34895, holotype, male, 34 mm SL.

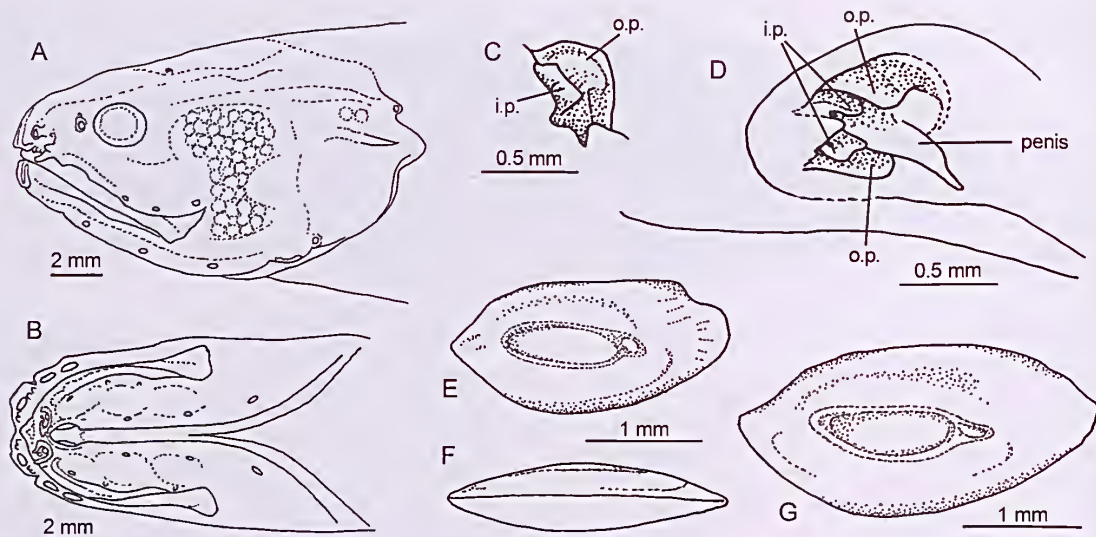


Fig. 23. *Alionematchthys shinoharai* sp. nov., A, lateral view of head, holotype; B, ventral view of head, holotype; C, view of left pseudoclaspers from inside, holotype; D, inclined lateral view of male copulatory organ, holotype; E, median view of right otolith, holotype; F, ventral view of right otolith, holotype; G, median view of right otolith, YCM-P36416, female, 42 mm SL.

Distribution. *Alionematchthys samoensis* is endemic to the Islands of the Samoa group, and is in fact the only endemic Dinematchthyini restricted to that region (Fig. 16).

Biology. A 46 mm SL female (CAS 81486) contains ca. 100 embryos, length 4.6 mm TL.

Each embryo with three short pigmented rows on the posterior part of the body.

Etymology. Named after the type locality, American Samoa. It is an adjective.

Alionematchthys shinoharai sp. nov.

(Figs 1, 22, 23, Tables 1, 10)

Material examined. (2 specimens, 34–42 mm SL). HOLOTYPE – NSMT-P 34895, male, 34 mm SL, 28°11'2"N, 129°16'E, Sakinome beach, Amami-Oshima Island, Ryukyu Islands, Japan, 5 m, K. Matsuura and M. Aizawa, 14 June 1991. PARATYPES – YCM-P 36416, female, 42 mm SL, Amami Islands, Kakeroma Island, Ryukyu Islands, Japan, 24 Aug. 1995.

Diagnosis. Vertebrae 11+32–33=43–44, dorsal fin rays 83–85, anal fin rays 67; eyes large (3.0–3.3% SL); body slender, snout pointed, without cirri; scales on cheeks, two scales above opercular spine; upper preopercular pore absent; outer pseudoclasper broad-based simple flap; inner pseudoclasper very small, somewhat depressed; otolith moderately elongate, length to height 2.1–2.2, with regularly curved dorsal rim, sulcus small, otolith length to sulcus length 1.9–2.0, cauda very small, ostium length to cauda length 5.5–7, ostium height to cauda height 2.2–2.7.

Description (Figs 22–23). The principal meristic and morphometric characters are shown in Table 10. Mature at

about 35–40 mm SL (male of 34 mm SL probably subadult). Body slender, with pointed head profile. No cirri on snout. Eye size 3.3 (3.0)% SL. Head with scale patch on cheeks containing 7 vertical rows of scales on upper part and 4 vertical rows on lower part, 2 scales on opercle above opercular spine. Horizontal diameter of scales on body of holotype 1.5% SL, in about 24 horizontal rows. Maxillary ending far behind eye, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end expanded with small knob. Anterior nostril positioned high, one-third distance from upper lip to anterior margin of eye. Posterior nostril with narrow elevated rim, about one-eighth the size of eye. Opercular spine with free tip, sharply pointed. Anterior gill arch with 15 (16) rakers, 3 elongate. Pseudobranchial filaments 2.

Head sensory pores (Fig. 23A, B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior), three posterior pores about one-third the size of three anterior pores. Mandibular pores 6 (3 anterior and 3 posterior): first anterior pore large, tubular, with single cirrus anteriorly. Preopercular pores: 3 lower, first and second with joined opening, covered by dermal flap in lateral view; third tubular; upper preopercular pore absent. [See description of *Alionematchthys ceylonensis* for position of pores.]

Dentition (of holotype). Premaxilla with 5 outer rows of granular teeth and 1 inner row of larger teeth anteriorly. Anteriormost teeth in inner row up to 1/4 diameter of pupil. Vomer horseshoe-shaped, with 1 outer row of small teeth and 1 inner row of larger teeth up to 1/5 diameter of pupil. Palatine with 1 outer row of small teeth and 1 inner row of longer teeth up to 1/4 diameter of pupil. Dentary with 5

Table 10. Meristic and morphometric characters of *Alionematchthys shinoharai* sp. nov.

	Holotype NSMT- P34895	Paratype YCM- P36416
Standard length in mm	33	42
Meristic characters		
Dorsal fin rays	83	85
Caudal fin rays	14	14
Anal fin rays	67	67
Pectoral fin rays	22	22
Precaudal vertebrae	11	11
Caudal vertebrae	33	32
Total vertebrae	44	43
Rakers on anterior gill arch	16	15
Pseudobranchial filaments	2	2
D/V	6	5
D/A	20	24
V/A	13	14
Morphometric characters in % of SL		
Head length	27.2	26.7
Head width	11.9	12.8
Head height	15.9	16.2
Snout length	5.6	6.5
Upper jaw length	13.8	13.8
Diameter of pigmented eye	3.0	3.3
Diameter of pupil	2.0	2.1
Interorbital width	6.5	7.0
Posterior maxilla height	4.0	4.0
Postorbital length	19.8	18.0
Preanal length	44.8	44.9
Predorsal length	32.0	32.6
Body depth at origin of anal fin	16.1	18.1
Pectoral fin length	14.1	15.1
Pectoral fin base height	6.6	5.5
Ventral fin length	24.7	22.6
Base ventral fin - anal fin origin	25.2	24.1

outer rows of granular teeth and 1 inner row of larger teeth anteriorly, up to about 1/3 diameter of pupil.

Otolith (Fig. 23E–G). Moderately elongate in shape, length to height 2.1–2.2 (34–40 mm SL), rather thick (otolith height to otolith thickness about 2). Anterior tip sharply pointed, posterior tip pointed, slightly expanded.

Dorsal rim gently curved, with postdorsal angle in male specimen (Fig. 23E) and absent in female (Fig. 23G), exhibiting slight sexual dimorphism. Inner and outer face moderately convex, smooth. Otolith length to sulcus length 1.9–2.0. Sulcus medianly positioned, slightly inclined, with separated colliculi, without marked notch at ventral rim of sulcus at joint of ostium with cauda. Cauda very small, ostium length to cauda length 5.5–7, ostium height to cauda height 2.2–2.7. Ventral furrow feeble, close to ventral rim of otolith.

Axial skeleton. Neural spine of vertebra 4 inclined and 5–8 depressed. Parapophyses present from vertebrae 6 to 11. Pleural ribs on vertebrae 2 to 10. First anal fin pterygiophore only slightly longer than subsequent pterygiophore.

Male copulatory organ (Fig. 23C, D). Two pairs of small pseudoclaspers, which may not be fully mature in single male specimen investigated. Outer pseudoclasper a simple flap with broad base; inner pseudoclasper a small depressed flap without significant indentation. Isthmus moderately narrow; penis slightly curved, longer than outer pseudoclaspers.

Colour. Live colour unknown. Preserved colour uniformly light brown.

Comparison. *Alionematchthys shinoharai* belongs to the species group without an upper preopercular pore together with *A. ceylonensis*, *A. phuketensis* and *A. plicatosurculus*. It differs from all these in the presence of two scales above the opercular spine (vs none), the somewhat less highly positioned anterior nostril with one-third distance from upper lip to anterior margin of eye (vs 1/2–2.5) and the peculiar otolith with its short sulcus and the very small cauda. The combination of these characters is so distinctive that they could indicate a separate genus, which, however, will be subject to review of a larger male specimen in order to fully evaluate the pseudoclasper pattern.

Distribution. *Alionematchthys shinoharai* has so far only been found at the northern islands of the Ryukyu Island chain of Japan, i.e. Amami-Oshima (Fig. 1).

Etymology. Named in honour of Gento Shinohara, NSMT, Tokyo, in recognition of his many contributions to ichthyology and for his kind support of the present revision. It is a noun in apposition.

**Fig. 24.** *Alionematchthys suluensis* sp. nov., AMS I.40149-028, holotype, male, 40 mm SL.

Alionematchthys suluensis sp. nov.

(Figs 9, 24, 25, Tables 1, 11)

Material examined. (57 specimens, 26–49 mm SL).

HOLOTYPE – AMS I.40149-028, male, 40 mm SL, 12°21.70'N, 121°27.57'E, 0–20 m, rocky surge area at base of cliffs, S tip of Buyamao Island off SE Mindoro Island, Philippines, coll. MIN team, rotenone, 30 May 2000. **PARATYPES** – AMS I.40149-028, 1 male, 30 mm SL, 5 females, 30–42 mm SL, 3 juveniles, 13–17 mm SL, same data as holotype; USNM 263691, 1 male, 43 mm SL and 5 females, 41–45 mm SL, 08°51'42"N, 123°24'36"E, Solino Island, Zamboanga, Mindanao, Philippines, 0–5 m, A. Alcala *et al.*, 4 May 1979; USNM 263694, 6 males and 12 females, 27–49 mm SL, 10°52'N, 121°12'E, Palawan, Philippines; USNM 376216, 4 males and 1 female, 29–45 mm SL, 09°04'N, 123°08'E, Negros, Philippines; USNM 366601, 1 male, 46 mm SL, 09°04'N, 123°16'E, Apo Island, Philippines; USNM 366602, 1 female, 34 mm SL, 09°23'N, 123°15'E, Negros, Philippines; USNM 374183, 1 male, 31 mm SL, 10°35'05"N, 122°08'30"E, rocky tidepool, Talisayan Point, San Joaquin, Lawigan, Iloilo Province,

Philippines, 0–7 m, J. T. Williams *et al.*, 25 Sep. 1995; USNM 376179, 3 males and 6 females, 26–48 mm SL, 09°03'N, 122°59'E, Negros, Philippines; USNM 376181, 3 males, 37–44 mm SL, 10°55'05"N, 121°02'03"E, Putic Island, Palawan, Philippines, 0–4.6 m, V. Springer *et al.*, 22 May 1978; USNM 376182, 2 males, 34 and 44 mm SL, 09°06'30"N, 122°55'24"E, near Giligaon, north of Maloh, Negros, Philippines, 0–2 m, L. W. Knapp *et al.*, 26 April 1979; USNM 376186, 2 males, 32 and 34 mm SL and 1 female, 41 mm SL, 08°51'24"N, 123°24'36"E, Solino Island, Zamboanga, Mindanao, Philippines, 0–5 m, L. W. Knapp *et al.*, 3 May 1979.

Diagnosis. Vertebrae 11–12+30–32=41–43, dorsal fin rays 72–82, anal fin rays 56–64; eyes moderately large (2.1–2.5% SL); body slender, snout without cirri; scales only on cheeks, no scales above opercular spine; upper preopercular pore present; outer pseudoclasper moderately broadbased, long, sometimes extending beyond hood in resting position; inner pseudoclasper half as long as outer pseudoclasper, anterior lobe very long, twice as long as posterior lobe; otolith length to height 2.1–2.2, with shallow

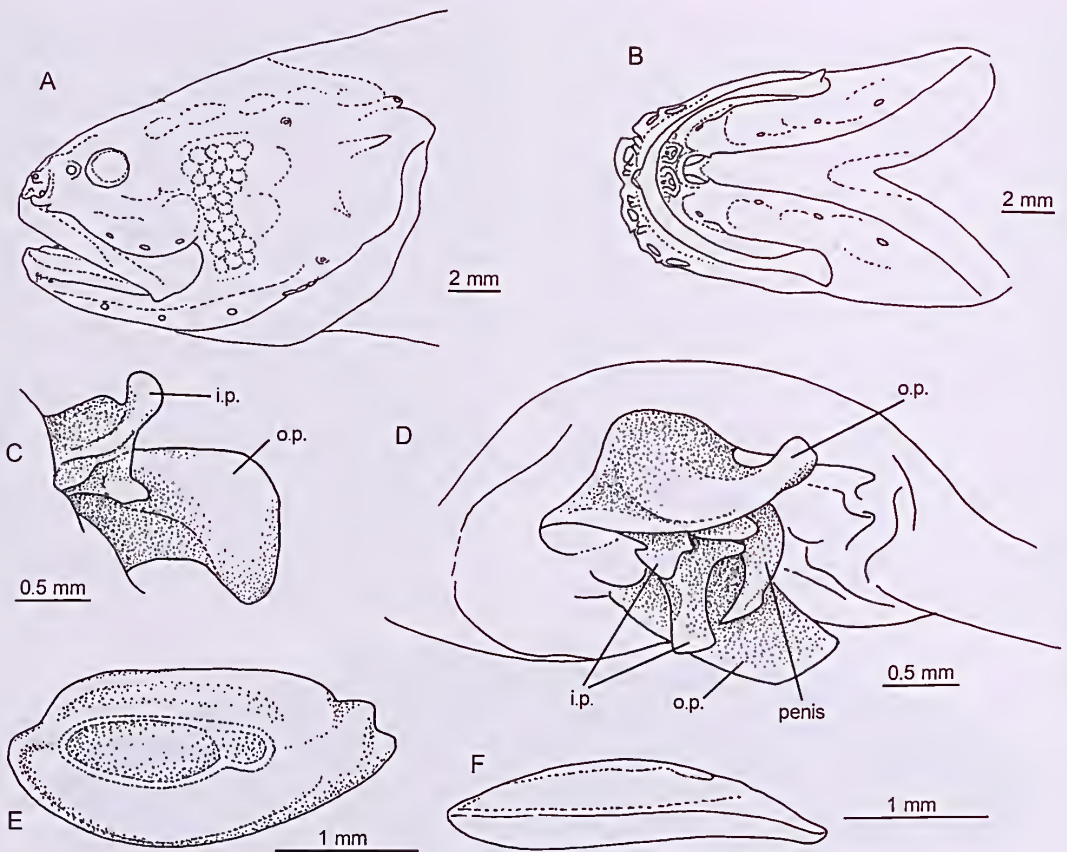


Fig. 25. *Alionematchthys suluensis* sp. nov., A, lateral view of head, holotype; B, ventral view of head, holotype; C, view of left pseudoclaspers from inside, holotype; D, inclined lateral view of male copulatory organ, holotype; E, median view of right otolith, AMS I.40149-028, female, 40 mm SL; F, ventral view of right otolith, AMS I.40149-028, female, 40 mm SL.

Table 11. Meristic and morphometric characters of *Alionematischthys suluensis* sp. nov.

	Holotype AMS 1. 40149- 028	Holotype + 56 paratypes	n
		Mean (range)	
Standard length in mm	40	36.7 (13-48)	57
Meristic characters			
Dorsal fin rays	80	77.5 (72-82)	28
Caudal fin rays	16	15.8 (15-16)	21
Anal fin rays	63	60.2 (56-64)	28
Pectoral fin rays	20	20.2 (19-22)	12
Precaudal vertebrae	11	11.5 (11-12)	28
Caudal vertebrae	32	30.7 (30-32)	28
Total vertebrae	43	42.1 (41-43)	28
Rakers on anterior gill arch	14	14.5 (12-16)	11
Pseudobranchial filaments	2	2	11
D/V	6	6.1 (6-7)	28
D/A	23	22.3 (20-25)	28
V/A	13	13.6 (13-15)	28
Morphometric characters in % of SL			
Head length	24.4	25.2 (23.9-27.0)	11
Head width	12.2	11.9 (10.2-13.6)	11
Head height	14.5	15.1 (14.3-16.6)	11
Snout length	5.7	5.5 (4.9-6.1)	11
Upper jaw length	12.3	13.0 (12.3-13.9)	11
Diameter of pigmented eye	2.2	2.2 (2.1-2.5)	11
Diameter of pupil	1.2	1.4 (1.2-1.7)	11
Interorbital width	6.3	6.6 (6.0-7.4)	11
Posterior maxilla height	4.0	4.2 (3.7-4.7)	11
Postorbital length	16.9	18.0 (16.9-18.9)	11
Preal anal length	46.0	46.5 (43.6-48.6)	11
Predorsal length	?	31.0 (29.4-32.5)	10
Body depth at origin of anal fin	15.7	15.8 (13.5-18.4)	11
Pectoral fin length	12.1	12.9 (10.8-14.5)	11
Pectoral fin base height	4.4	5.3 (4.4-5.8)	11
Ventral fin length	25.6	24.0 (21.2-25.9)	11
Base ventral fin - anal fin origin	28.6	28.4 (26.0-31.6)	11

dorsal rim and postdorsal angle, otolith length to sulcus length 1.7–1.8, ostium length to cauda length 3.3–3.7.

Description (Figs 24, 25). The principal meristic and morphometric characters are shown in Table 11. One of the smallest species in the genus; mature at about 30 mm SL, maximum size about 50 mm SL. Body slender, with moderately pointed head profile. No cirri on snout. Eye size 2.1–2.5 (2.2)% SL. Head with scale patch on cheek containing 5–7 (5) vertical rows of scales on upper part and 3 vertical rows on lower part, no scales on opercle. Horizontal diameter of scales on body about 2.0% SL, in 24 horizontal rows. Maxillary ending far behind eye, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end expanded with little knob. Anterior nostril positioned high, one-third distance from upper lip to anterior margin of eye. Posterior nostril small, about one-

sixth the size of eye. Opercular spine with free tip, pointed. Anterior gill arch with 12–16 (14) rakers, 3 elongate in a row. Pseudobranchial filaments 2.

Head sensory pores (Fig. 25A, B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior), three posterior pores about half the size of three anterior pores. Mandibular pores 6 (3 anterior and 3 posterior): first anterior pore large, tubular, with single cirrus anteriorly. Preopercular pores: 3 lower, first and second with joined opening, covered by dermal flap in lateral view; third tubular; upper preopercular pore present. [See description of *Alionematischthys ceylonensis* for position of pores.]

Dentition (of holotype). Premaxilla with 4 outer rows of granular teeth and 1 inner row of larger teeth anteriorly. Anteriormost teeth in inner row up to 3/4 diameter of pupil. Vomer horseshoe-shaped, with 1 outer row of small teeth and 1 inner row of larger teeth up to 1/3 diameter of pupil. Palatine with an outer row of small teeth and an inner row of larger teeth up to 1/3 diameter of pupil. Dentary with 3 outer rows of granular teeth and 1 inner row of larger teeth anteriorly, merging into 1 row of larger teeth posteriorly. Large dentary teeth up to about 3/4 diameter of pupil.

Otolith (Fig. 25E, F). Moderately elongate in shape, length to height 2.1–2.2 (30–49 mm SL) and moderately thick (otolith height to otolith thickness about 1.5). Anterior tip slightly pointed, posterior tip pointed, expanded and irregularly ornamented. Dorsal rim shallow, with notch above anterior tip and behind marked postdorsal angle. Inner face convex, outer face slightly concave to almost flat, both smooth. Otolith length to sulcus length 1.7–1.8. Sulcus slightly supramedially positioned and slightly inclined, with separated colliculi and marked notch at ventral rim of sulcus at joint of ostium with cauda. Ostium length to cauda length 3.3–3.7. Ventral furrow very close to ventral rim of otolith.

Axial skeleton. Neural spine of vertebra 4 inclined and 5–8 depressed. Parapophyses present from vertebrae 6 to 11 (12). Pleural ribs on vertebrae 2 to 11 (12). First anal fin pterygiophore markedly longer than subsequent pterygiophore, reaching tip of last precaudal parapophysis in males.

Male copulatory organ (Fig. 25C, D). Two pairs of pseudoclaspers, outer sometimes extending beyond hood in resting position. Outer pseudoclasper moderately broad based with thick supporter bent backwards at tip; inner pseudoclasper about half the length, thin, with very long anterior inclined lobe about twice as long as small posterior lobe. Isthmus narrow; penis curved, slightly shorter than outer pseudoclaspers.

Colour. Live colour unknown. Preserved colour uniformly brown.

Comparison. *Alionematischthys suluensis* belongs to the species group with an upper preopercular pore, large eyes and no scales above the opercular spine as *A. piger* and *A. samoensis*. It differs from both in the lack of cirri on the snout (except for a single cirrus associated with the



Fig. 26. *Alionemachthys winterbottomi* sp. nov., ROM 47597, holotype, male, 54 mm SL.

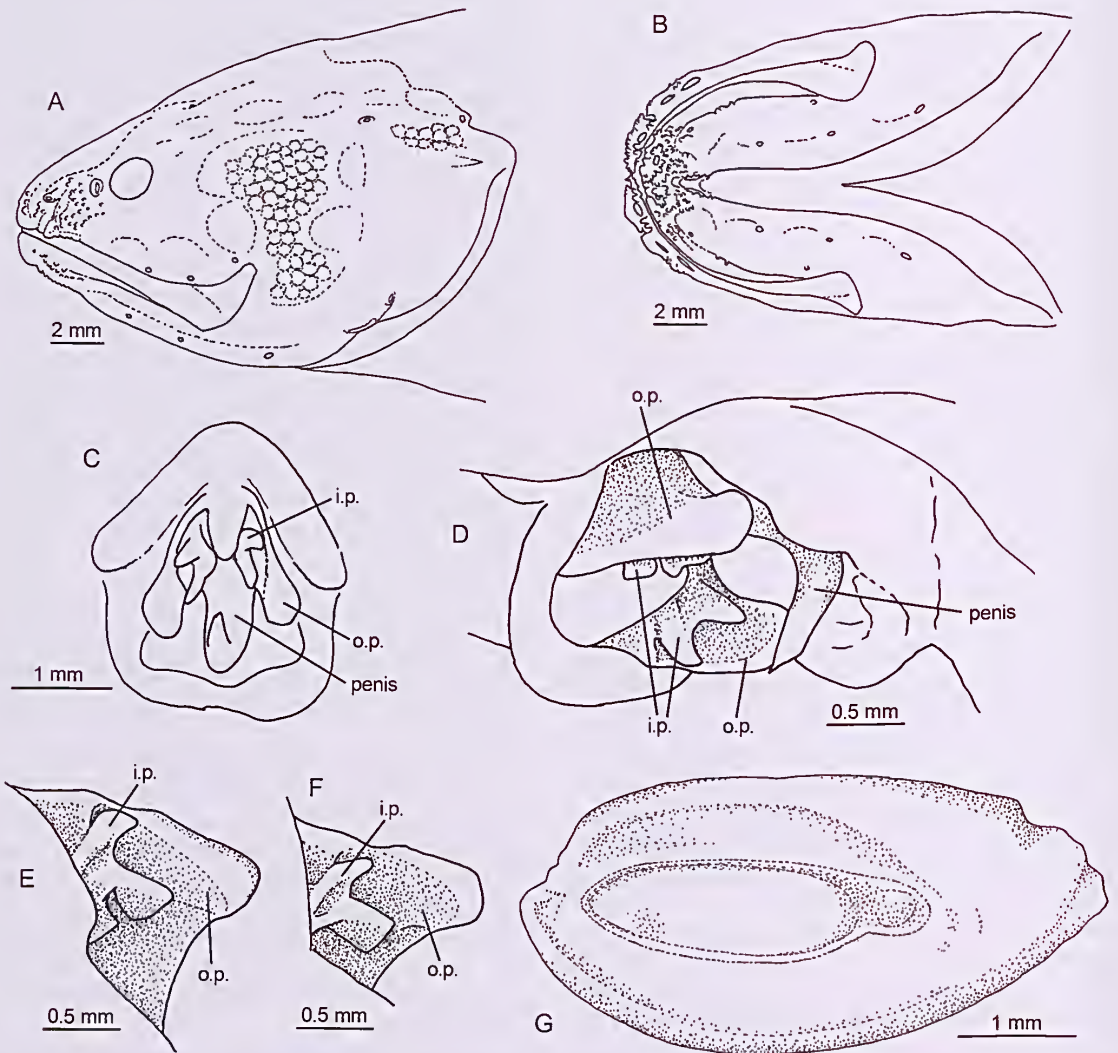


Fig. 27. *Alionemachthys winterbottomi* sp. nov., A, lateral view of head, ROM 47597, holotype, male, 54 mm SL; B, ventral view of head, holotype; C, ventral view of male copulatory organ, ROM 82975, paratype, 58 mm SL; D, inclined lateral view of male copulatory organ, ROM 82975, paratype, 58 mm SL; E, view of left pseudoclasps from inside, ROM 82975, paratype, 65 mm SL; F, view of left pseudoclasps from inside, holotype; G, median view of right otolith, CAS 227284, male, 76 mm SL.

first anterior mandibular pore) and the very peculiar shape of the inner pseudoclasper with its long anterior thorn.

Distribution. *Alionematichthys suluensis* appears to be restricted in distribution to the Philippines between 13° and 8° N, mainly in the Sulu Sea, where it co-occurs with *A. piger*, *A. plicatosurculus* and *A. riukiensis* (Fig. 16).

Biology. A 39 mm SL female (USNM 376179), contains 325 embryos, length 3.7 mm TL.

Etymology. Named after the type locality, the Sulu Sea of the Philippines. It is an adjective.

Alionematichthys winterbottomi sp. nov.

(Figs 16, 26, 27, Tables 1, 12)

Material examined. (217 specimens, 10–88 mm SL). HOLOTYPE – ROM 47597, male, 80 mm SL, 18°45'52"S, 178°31'13"E, shallow reef off first black rock 300 m S of University of the South Pacific Research Station, Dravuni Island, Fiji, coll. R. Winterbottom, A. R. Emery, F. Emery and R. McKinnon, 20 March 1983. PARATYPES – CAS 222530, 2 males, 56 and 57 mm SL and 1 female, 42 mm SL, Vatumatavu Bay, Fiji, D. W. Greenfield *et al.*, 12 Nov. 2002; CAS 227291, 1 male, 65 mm SL and 1 female, 57 mm SL, Viti Levu north, Fiji, D. W. Greenfield *et al.*, 31 March 2002; CAS 222532, 1 male, 48 mm SL, 1 female, 49 mm SL and 1 juvenile, 29 mm SL, Fiji, D. W. Greenfield *et al.*, 14 Nov. 2002; CAS 222540, 1 female, 52 mm SL, Fiji, 3 April 2002; CAS 222544, 2 males, 42 and 48 mm SL and 2 females, 45 and 55 mm SL, Fiji, D. W. Greenfield *et al.*, 14 March 1982; CAS 222552, 4 males, 51–70 mm SL, 2 females, 48–54 mm SL, and 2 juveniles, 22–23 mm SL, Great Sea reef, Kia Island, Fiji, D. W. Greenfield *et al.*, 31 March 2002; CAS 222558, 1 male, 63 mm SL, and 1 juvenile, 35 mm SL, Fiji, D. W. Greenfield *et al.*, 15 Nov. 2002; CAS 227284, 7 males, 54–75 mm SL and 5 females, 41–64, Fiji, reef NE of Yaqaga Island and NW of Ovatoa reef, D. W. Greenfield *et al.*, 25 March 2002; CAS 227307, 3 males, 42–57 mm SL, 3 females, 40–59 mm SL, Bua Bay, Fiji, D. W. Greenfield *et al.*, 24 March 2002; CAS 222586, 2 males, 42–44 mm SL and 3 females, 43, 50 and 50 mm SL, Nasau Bay, Vanua Levu, Fiji, D. W. Greenfield *et al.*, 25 May 2003; CAS 222589, 1 female, 57 mm SL, Fiji, D. W. Greenfield *et al.*, 25 May 2003; CAS 222590, 2 males, 51 and 65 mm SL, 1 juvenile, 25 mm SL; Fiji east shore, D. W. Greenfield *et al.*, 15 March 2002; CAS 222592, 1 male, 46 mm SL, 2 females, 31 and 44 mm SL, Budd Reef, Fiji, D. W. Greenfield *et al.*, 23 May 2003; CAS 227294, 1 male, 57 mm SL, Fiji, D. W. Greenfield *et al.*, 20 May 2003; CAS 227295, 4 males, 45–57 mm SL, 12 females, 29–58 mm SL, Budd Reef, Fiji, D. W. Greenfield *et al.*, 22 May 2003; CAS 227297, 1 male, 53 mm SL and 3 females, 35–52 mm SL, Fiji, D. W. Greenfield *et al.*, 23 May 2003; CAS 222605, 2 females, 44 and 73 mm SL, Fiji, D. W. Greenfield *et al.*, 5 January 2003; CAS 227298, 1 female, 88 mm SL, Fiji, D. W. Greenfield *et al.*, 28 May 1999; CAS 227299, 3 males, 55–75 mm SL and 1 female, 53 mm SL, Fiji, D. W. Greenfield *et al.*, 29 January 2002; CAS 222608, 3 males,

Table 12. Meristic and morphometric characters of *Alionematichthys winterbottomi* sp. nov.

	Holotype ROM 47597	Holotype + 198 paratypes	n
	Mean (range)		
Standard length in mm	80	48.9 (10–88)	199
Meristic characters			
Dorsal fin rays	81	82.5 (80–86)	24
Caudal fin rays	16	16	24
Anal fin rays	62	63.9 (61–65)	24
Pectoral fin rays	22	21.3 (20–22)	11
Precaudal vertebrae	12	11.0 (11–12)	26
Caudal vertebrae	31	31.0 (29–32)	26
Total vertebrae	43	42.0 (40–43)	26
Rakers on anterior gill arch	17	18.3 (17–20)	11
Pseudobranchial filaments	2	1.9 (1–2)	11
D/V	5	5.7 (5–6)	26
D/A	22	23.1 (21–24)	26
V/A	13	13	26
Morphometric characters in % of SL			
Head length	27.2	27.3 (26.3–27.8)	11
Head width	15.9	15.5 (14.0–17.2)	11
Head height	16.4	16.9 (15.9–18.3)	11
Snout length	5.2	6.0 (5.2–6.5)	11
Upper jaw length	14.4	14.4 (13.6–15.1)	11
Diameter of pigmented eye	2.2	2.5 (2.2–3.0)	11
Diameter of pupil	1.4	1.5 (1.2–1.7)	11
Interorbital width	6.8	7.1 (6.2–7.9)	11
Posterior maxilla height	5.0	4.9 (4.5–5.4)	11
Postorbital length	20.4	20.0 (19.5–20.6)	11
Precanal length	47.1	46.9 (44.7–48.6)	11
Predorsal length	30.7	31.5 (30.4–32.5)	11
Body depth at origin of anal fin	19.7	18.2 (17.2–19.7)	11
Pectoral fin length	15.3	14.6 (13.2–15.5)	11
Pectoral fin base height	6.7	6.6 (6.3–7.2)	11
Ventral fin length	22.8	23.0 (21.4–24.4)	11
Base ventral fin - anal fin origin	26.3	26.7 (23.4–29.5)	11

38–44 mm SL, Fiji, D. W. Greenfield *et al.*, 7 February 2002; CAS 222613, 3 males, 43–60 mm SL, Barrier reef of Suva, Fiji, D. W. Greenfield *et al.*, 27 Jan. 2002; CAS 222619, 1 male, 64 mm SL, Fiji, D. W. Greenfield *et al.*, 31 May 1999; CAS 222621, male, 46 mm SL, female, 50 mm SL, Nukalau Island, off Suva, D. W. Greenfield *et al.*, 28 Jan. 2002; ROM 82975, 26 males, 34–78 mm SL, 57 females, 22–75 mm SL, 16 juveniles, 10–34 mm SL, same data as holotype; ROM 82977, 5 females 45–70 mm SL, 2 males, 60 and 77 mm SL, 18°46'30"S, 178°30'28"E, off Yanu-Yanu-Sau Island, south of Dravuni, Fiji, A. R. Emery and party, 30 Mar. 1983.

Additional material. USNM 377255, 15 specimens, Vuro, Fiji; USNM 378376, 4 specimens, 27–50 mm SL, Malolo, Fiji; USNM 257649, 1 male and 2 females, 32–58 mm SL, 17°11'S, 176°54'E, Yasawa Group, Viwa Island, Fiji; USNM 263659, 2 males and 2 females,

30–72 mm SL, 18°52'S, 178°30'E, Kandavu Island, Fiji; USNM 374211, 1 male, 65 mm SL, 21°20'S, 174°58'W, Eua, Tonga; USNM 366566, 9 specimens, 36–77 mm SL, 18°50'S, 178°32'E, Kandavu Island, Fiji; USNM 376196, 2 females, 39–48 mm SL, 18°56'S, 178°21'W, Lau Group, Yagasa Island, Fiji; USNM 376209, 1 male and 1 female, 45–49 mm SL, 17°06'S, 177°13'E, Yasawa Group, Naviti Island, Fiji.

Diagnosis. Vertebrae 11(–12)+29–32=40–43, dorsal fin rays 80–86, anal fin rays 61–65; eyes moderately large (2.2–3.0% SL); body moderately slender, snout with many cirri; scales on cheeks, patch of scales above opercular spine with 5–9 scales; upper preopercular pore present; outer pseudoclasper broad-based, not extending beyond hood in resting position; inner pseudoclasper short, thin, free from outer pseudoclasper, bifurcate, anterior pointed lobe short, posterior lobe much expanded posteriorly; otolith length to height 2.0–2.2, with shallow dorsal rim and weak postdorsal angle, otolith length to sulcus length 1.6–1.7, ostium length to cauda length 3.0–4.5.

Description (Figs 26, 27). The principal meristic and morphometric characters are shown in Table 12. Mature at about 45 mm SL. Body moderately slender, with pointed head profile. Many cirri on snout. Eye size 2.2–3.0 (2.2)% SL. Head with scale patch on cheek containing 8–10 (9) vertical rows of scales on upper part and 4 vertical rows on lower part, 5–9 (9) scales on opercle above opercular spine. Horizontal diameter of scales on body in holotype about 1.9% SL, in 30 horizontal rows. Maxillary ending far behind eye, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end expanded. Anterior nostril positioned high, 1/2.5 distance from upper lip to anterior margin of eye. Posterior nostril small, about one-quarter the size of eye. Opercular spine with free tip, pointed. Anterior gill arch with 17–20 (17) rakers, Upper branch with one knob-like raker and 3–5 (3) plate-shaped rakers and lower branch with 13–15 (13) rakers, all plate-shaped except for knob-shaped first and third. Pseudobranchial filaments 1–2 (usually 2).

Head sensory pores (Fig. 27A, B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior), three posterior pores about one-third size of three anterior pores. Mandibular pores 6 (3 anterior and 3 posterior): first anterior pore large, tubular. Preopercular pores: 3 lower, first and second with joined opening, covered by dermal flap in lateral view; third tubular; upper preopercular pore present. [See description of *Alionemataichthys ceylonensis* for position of pores.]

Dentition (of holotype). Premaxilla with 7 outer rows of granular teeth and 2 inner rows of larger teeth anteriorly. Anteriormost teeth in inner row up to 1/3 diameter of pupil. Vomer horseshoe-shaped, with 3 outer rows of small teeth and 1 inner row of large teeth up to 1/3 diameter of pupil. Palatine with 3 outer rows of small teeth and 1 inner row of 8 large teeth up to 1/3 diameter of pupil. Dentary with 5 outer rows of granular teeth and 1 inner row of larger teeth

anteriorly, merging into 1 row of larger teeth posteriorly. Thirteen large dentary teeth, up to about 2/3 diameter of pupil.

Otolith (Fig. 27G). Moderately elongate in shape, length to height 2.0–2.2 and moderately thin (otolith height to otolith thickness about 2.2–2.8). Anterior tip slightly pointed, posterior tip pointed, expanded and irregularly ornamented. Dorsal rim shallow, with notch above anterior tip and with indistinct postdorsal angle. Inner face convex, outer face slightly concave to flat, both smooth. Otolith length to sulcus length 1.6–1.7. Sulcus slightly supramedially positioned and slightly inclined, with separated colliculi and marked notch at ventral rim of sulcus at joint of ostium with cauda. Ostium length to cauda length 3.0–4.0 (4.5). Ventral furrow weak, very close to ventral rim of otolith.

Axial skeleton. Neural spine of vertebra 4 inclined and 5–8 depressed. Parapophyses present from vertebrae 6 to 11 (12). Pleural ribs on vertebrae 2 to 11 (12). First anal fin pterygiophore slightly to markedly longer than subsequent pterygiophore, but not reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 27C–F). Two pairs of pseudoclaspers, outer not extending beyond hood in resting position. Outer pseudoclasper broad based, nearly triangular in shape, somewhat thickened towards tip; inner pseudoclasper less than half the length, thin, bifurcate, anterior pointed lobe short, anteriorly free from outer pseudoclasper halfway up from base, posterior lobe much expanded posteriorly. Isthmus narrow; penis curved, slightly longer than outer pseudoclaspers.

Colour. After preservation the specimens are uniformly brownish.

Comparison. *Alionemataichthys winterbottomi* belongs to the species group with an upper preopercular pore, large eyes, many cirri on the snout and within that group to the subgroup with 5 or more scales above the opercular spine together with *A. riukuiensis*, from which it differs in the specific shape of the thin, free and small inner pseudoclasper with its bifurcate shape and the lack of scales below the opercular spine. Both species are obviously closely related to each other.

Distribution. *Alionemataichthys winterbottomi* is restricted in distribution to the Fiji and Tonga Islands, where it replaces *A. riukuiensis* (Fig. 16).

Etymology. Named in honour of Richard Winterbottom, ROM, Toronto, Canada, in recognition of his many contributions to ichthyology and for his great support of the present revision. It is a noun in apposition.

Alionemataichthys sp. 1

(Figs 16, 28, Table 1)

Material examined. (2 specimens, 75–87 mm SL). AMS 19108-032, 1 male, 75 mm SL, 14°40'S, 145°28'E, Lizard Island, Great Barrier Reef, Australia, 1–10 m, D. F. Hoese and party, 17 Nov. 1975; WAM P.30305-036, 1

female, 87 mm SL, 13°52'S, 126°56'E, Sir Graham Moore Islands, Western Australia, depth 0–1 m, G. R. Allen, 15 Aug. 1991.

Remarks. Two specimens from northern Australia are characterised by the presence of a uniform scale patch on the opercle reaching from above the opercular spine to well below it. The single male shows an inner pseudoclasper resembling that of *A. riukuensis* except for the anterior rim of the inner pseudoclasper being free of a connection to the outer pseudoclasper. All other characters, such as cirri on the snout, head pores, otolith measures, meristics and morphometrics perfectly fit within the variation of *A. riukuensis*. More material needs to be studied before it can be concluded if these specimens represent an extreme variant of *A. riukuensis* or a new species.

Alionematichthys sp. 2

(Figs 16, 29, Table 1)

Material examined. (1 specimen, 83 mm SL). WAM P.25111-047, 1 female, 83 mm SL, 20°28'30"S, 116°32'E,

Australia, Kendrew Island, Dampier Arch., G. R. Allen and R. Steene, 3. Nov. 1974.

Remarks. A single female specimen from NW Australia likely represents an undescribed species which is characterised by the absence of cirri on the snout, the absence of an upper preopercular pore (transformed to a wart) and the presence of two scales above the opercular spine. A similar combination of characters is found in *A. shinoharai*, from which it differs in the more stout and massive body and head and the longer sulcus on the inner face of the otolith. The scale patch on the cheek is remarkable for its uniform width with six vertical rows of scales on the upper part and five on the lower part. The otolith is characterised by a poor distinction of ostium and cauda and the small size of the cauda as found in *A. crassiceps*. Geographically, this record is just outside the distribution range of other species of *Alionematichthys*. We have refrained from establishing a new species due to the lack of a male specimen for investigation of the pseudoclasper morphology.

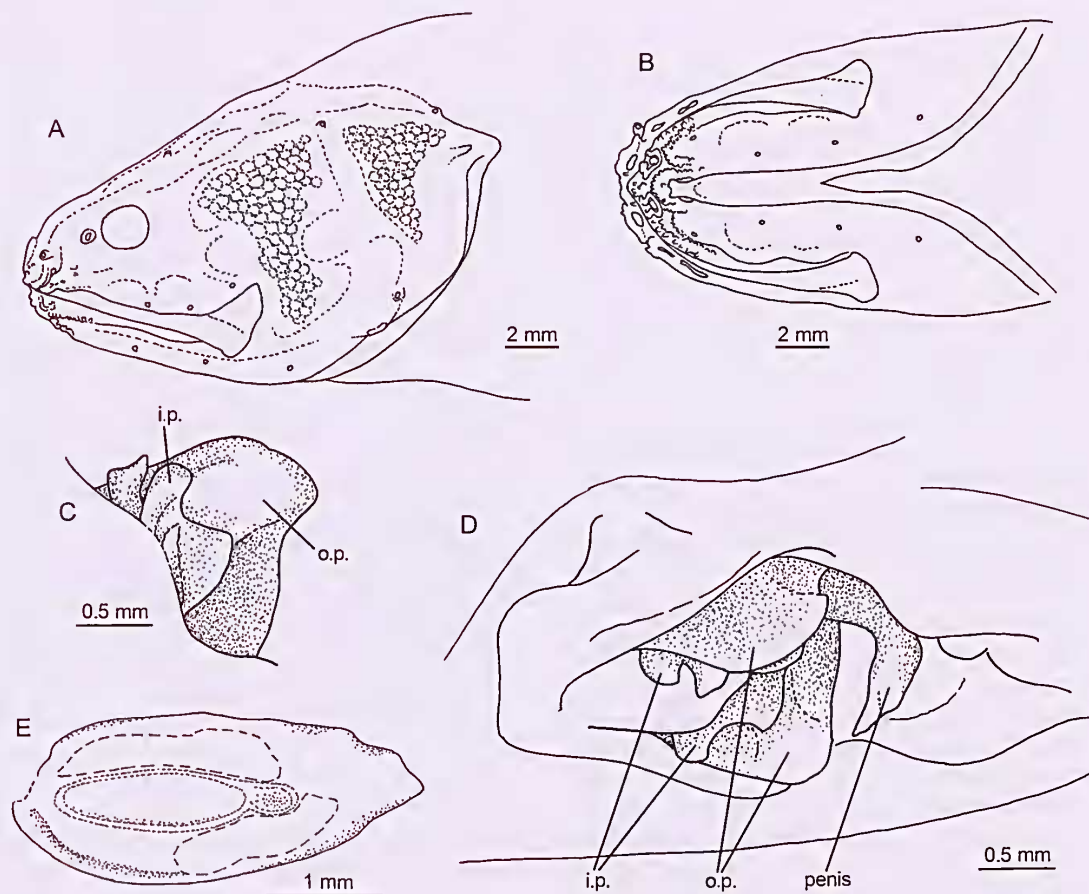


Fig. 28. *Alionematichthys* sp. 1, A, lateral view of head, AMS I.19108-032, male, 77 mm SL; B, ventral view of head, AMS I.19108-032, male, 77 mm SL; C, view of left pseudoclaspers from inside, AMS I.19108-032, male, 77 mm SL; D, inclined lateral view of male copulatory organ, AMS I.19108-032, male, 77 mm SL; E, median view of right otolith, WAM P.30305-036, female, 87 mm SL.

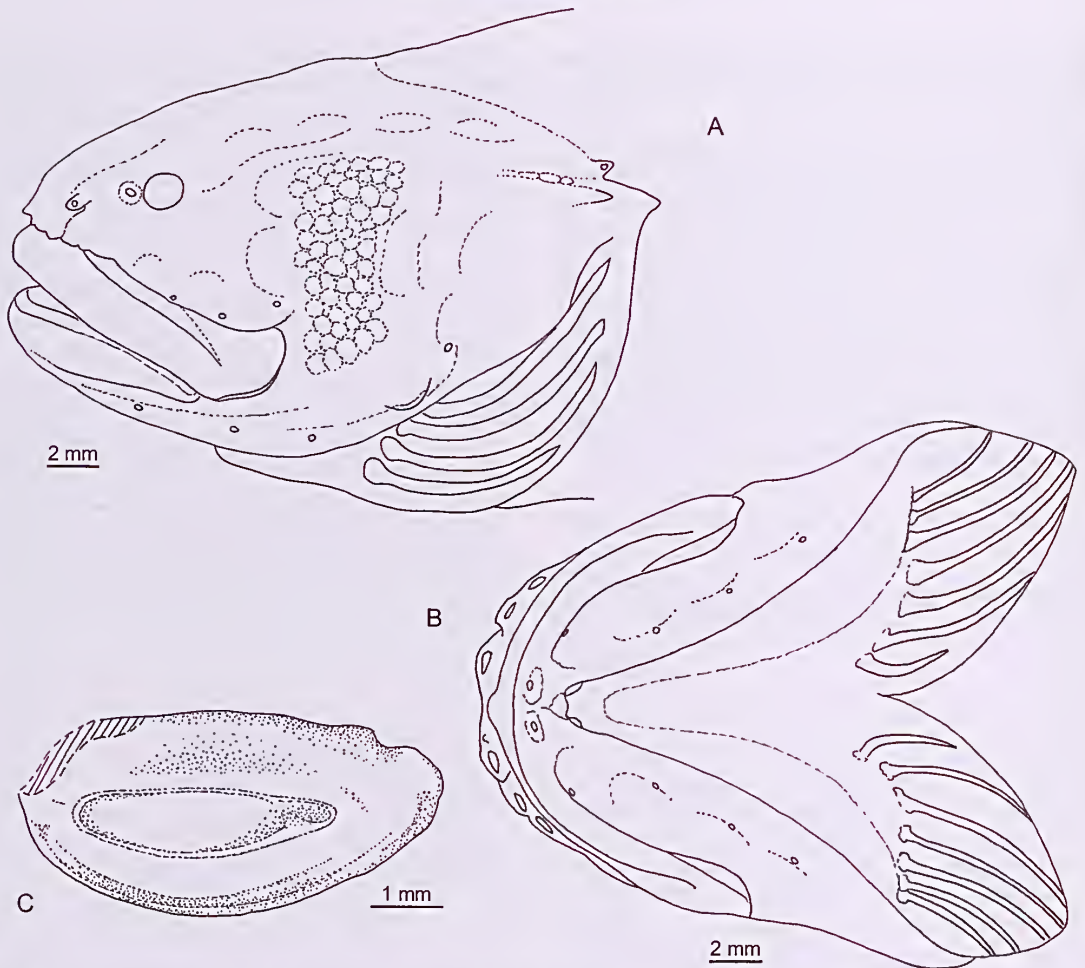


Fig. 29. *Alionematchthys* sp.2, WAM P.25111-047, female, 83 mm SL, A, lateral view of head, B, ventral view of head; C, median view of right otolith.

Dinematichthys Bleeker, 1855

Type species: *Dinematichthys iluocoeteoides* Bleeker, 1855 (type locality Kepulauan Batu, Sumatera Barat Province, Indonesia). Gender masculine.

Dinematichthys Bleeker, 1855 in part. — Cohen and Nielsen 1978; Cohen and Hutchins 1982; Machida 1994; Nielsen *et al.* 1999.

Diagnosis. Genus of *Dinematichthyini* with following combination of characters: anterior nostril placed high on snout at about 1/2–1/2.5 distance from lip to anterior rim of eye; head completely and continuously covered with scales on cheeks, opercle and occiput; cirri on snout; male copulatory organ with two pairs of small pseudoclaspers; outer pseudoclasper a simple flap, inner pseudoclasper a flap of about half size of outer, with two or three lobes; size up to about 110 mm SL; precaudal vertebrae usually 11 (10–12), total vertebrae 41–45, dorsal fin rays 75–92, anal fin rays 59–71, V in D 2.1–2.4; upper preopercular pore absent; sulcus of otolith with ostium at least two times as long as cauda; maxilla expanded postero-ventrally.

Comparison. *Dinematichthys* is readily recognised by its uniform and continuous head squamation including cheeks, opercle and occiput, usually visible without removal of mucus. The only other genus sharing this character is *Porocephalichthys* gen. nov., which does not overlap in distribution with *Dinematichthys* and which differs in many other characters (see *Porocephalichthys* gen. nov.). Even when in doubt, the combination of the absence of the upper preopercular pore, the small and simple shaped inner and outer pseudoclaspers, and the otolith with the sulcus divided into ostium and cauda, usually allow a reliable identification.

Species. *Dinematichthys* contains two species, the widely distributed *D. iluocoeteoides* known throughout the Indo-west Pacific and *D. trilobatus* sp. nov., endemic to the isolated Christmas and Cocos Islands of the Indian Ocean.

Remarks. The holotype was originally part of Bleeker's collection, who described the first ever *dinematichthyine* in 1855, *Dinematichthys iluocoeteoides*, from a single

specimen from Batu Island (now Kepulauan Batu, Sumatra Barat Province), off western Sumatra, Indonesia.

Bleeker's holotype has been lost (see extensive discussion in Cohen and Nielsen (1978)). A redefinition of the genus *Dinematichthys* and the species *D. ihuocoeteoides* is therefore necessary.

Cohen and Nielsen (1978) discussed the nature of a specimen from Bleeker's original collection (assigned by Günther (1862)) kept in London (BMNH 1862.2.28.65), but concluded that it could not be the original type (though it was later referred to as the holotype by Eschmeyer (1998) (also Online Catalog of Fishes, version 19 Sept. 2008, <http://www.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>). It is a male specimen and, although dried and shrivelled, is here designated as neotype since it resembles Bleeker's original description in all important aspects, and comes from the type locality and Bleeker's original collection.

***Dinematichthys ihuocoeteoides* Bleeker, 1855**

(Figs 30–32, Tables 1, 13)

Dinematichthys ihuocoeteoides Bleeker, 1855: 319; Günther 1862; Wourmes and Bayne 1973: 32; Cohen and Nielsen 1978: 58; Dor 1984: 59; Winterbottom *et al.* 1989: 14; Nielsen *et al.* 1999: 130.

Dinematichthys indicus Machida, 1994: 451; Nielsen *et al.* 1999: 130; Schwarzhans and Møller 2005: 78.

Dinematichthys randalli Machida, 1994: 456; Nielsen *et al.* 1999: 130.

Material examined. (1207 specimens, 11–112 mm SL). NEOTYPE – BMNH 1862.2.28.65, male, 61 mm SL, Batu Island, Indonesia, purchased from P. Bleeker. PARATYPES of *D. indicus*: ROM 37813-2, 3 males 45, 56 and 92 mm SL, 11 females, 49–77 mm SL, Chagos Archipelago, Indian Ocean, 7°17'30"N, 7°23'56"E, depth 1–2 m, ROM 58269, 5 males, 48–81 mm SL, 3 females, 36–64 mm SL, 12°23'52"S, 43°30'00"E, Chissioua Dzaha, Comoros, Indian Ocean.

Additional specimens. AMS 1. 17491-006, 1 male, 56 mm SL, 1 female, 59 mm SL, 9°09'S, 159°48'E, Savo Island, Solomon Islands, 0–10 m; AMS 1. 17492-015, 2 females, 41–48 mm SL, 09°0'S, 160°06'E, Florida Island, Solomon Islands; AMS 1. 20775-092, 1 male, 69 mm SL, Raine Island, Great Barrier Reef, Queensland, Australia; AMS 1. 22612-010, 1 male 56 mm SL and 2 females, 48 and 55 mm SL, 15°49'S, 145°50'E, Escape Reef, Great Barrier Reef, Queensland, Australia; AMS 1. 33693-008, 1 male, 66 mm SL, 11°42'45"S, 144°04'E, Great Detached Reef, Queensland, Australia, 6–19 m, AMS 1. 33708-062, 1 female, 50 mm SL, 10°59'98"S, 144°01'22"E, Reef 10-418, Queensland, Australia, 2–9 m, AMS 1. 37936-070, 1 female, 71 mm SL, 15°00'43"S, 168°03'30"E, Maewo Island, Vanuatu; BMNH 2000.4.19.370-382, 12 specimens, 57–103 mm SL, Abu Dhabi, Persian Gulf; BPBM 8023, 1 male, 86 mm SL, Marshall Islands; BPBM 8072, 2 females, 49–65 mm SL, Palau; BPBM 40933, 2 females, 36 and 59

mm SL, Chuuk, Caroline Islands, 0–4 m; BPBM 10816, 1 female, 59 mm SL, Guadalcanal, Solomon Isls; BPBM 11358, 1 male, 107 mm SL and 1 female, 93 mm SL, Fiji; BPBM 40935, 1 male, 47 mm SL, Ryukyu Islands, Japan; BPBM 17704, 1 female, 53 mm SL, Caroline Islands; BPBM 21795, 1 female, 72 mm SL, Mauritius; BPBM 40937, 1 female, 55 mm SL, Similan Island, Thailand; BPBM 40939, 2 females, 32 and 47 mm SL, Seychelles; BPBM 28591, 1 female, 73 mm SL, Philippines; BPBM 29149, 2 females, 55 and 67 mm SL, Marshall Islands; BPBM 30491, 1 female, Flores, Indonesia; BPBM 30860, 1 male, 49 mm SL, Persian Gulf; BPBM 30861, 1 female, 54 mm SL, Persian Gulf; BPBM 35199, 1 female, 80 mm SL, 27° 04'N, 142°12'30"E, Chichi-jima, Ogasawara Islands, Japan; BPBM 35276, 1 male, 74 mm SL, 1 juvenile,

Table 13. Meristic and morphometric characters of *Dinematichthys ihuocoeteoides* Bleeker, 1855.

	Neotype BMNH 1862.2.28.65	Neotype + 578 non-types	n
	Mean (range)		
Standard length in mm	61	55.7 (11–112)	579
Meristic characters			
Dorsal fin rays	84	83.1 (75–92)	137
Caudal fin rays	16	16.0 (15–16)	86
Anal fin rays	69	65.3 (59–71)	141
Pectoral fin rays	22	22.7 (21–24)	15
Precaudal vertebrae	11	11.0 (10–12)	151
Caudal vertebrae	31	31.5 (30–34)	153
Total vertebrae	42	42.6 (41–45)	153
Rakers on anterior gill arch	15	15.4 (13–19)	20
Pseudobranchial filaments	-	2	12
D/V	6	6.0 (5–7)	145
D/A	22	22.7 (19–26)	144
V/A	13	13.1 (12–14)	145
Morphometric characters in % of SL			
Head length	26.2	26.4 (25.8–27.1)	11
Head width	15.2	15.1 (12.2–20.9)	11
Head height	11.4	16.7 (11.4–18.9)	11
Snout length	4.9	5.9 (4.9–6.5)	11
Upper jaw length	13.5	13.4 (12.7–13.8)	11
Diameter of pigmented eye	2.8	2.7 (2.2–3.3)	11
Diameter of pupil	1.2	1.6 (1.2–2.0)	11
Interorbital width	4.9	6.5 (4.9–7.5)	11
Posterior maxilla height	6.2	4.6 (4.1–6.2)	11
Postorbital length	18.8	18.6 (17.8–19.2)	10
Prealanal length	45.7	47.2 (44.3–50.6)	11
Predorsal length	31.6	30.8 (29.2–31.8)	11
Body depth at origin of anal fin	19.4	19.3 (16.3–21.4)	11
Pectoral fin length	10.5	14.6 (10.5–16.2)	11
Pectoral fin base height	6.1	6.0 (5.2–6.9)	11
Ventral fin length	17.7	23.5 (17.7–25.6)	11
Base ventral fin - anal fin origin	27.4	27.1 (24.1–37.0)	10



Fig. 30. Sample sites of ○ *Dinematchthys ihuocoeteoides* Bleeker, 1855, ●* holotype of *D. ihuocoeteoides*, ○* holotype of *D. indicus*, ○* holotype of *D. randalli*, ⊗ *D. trilobatus* sp. nov. and ⊗ *Porocephalichthys dasyrhynechus* (Cohen and Hutchins, 1982). One symbol may represent several samples.

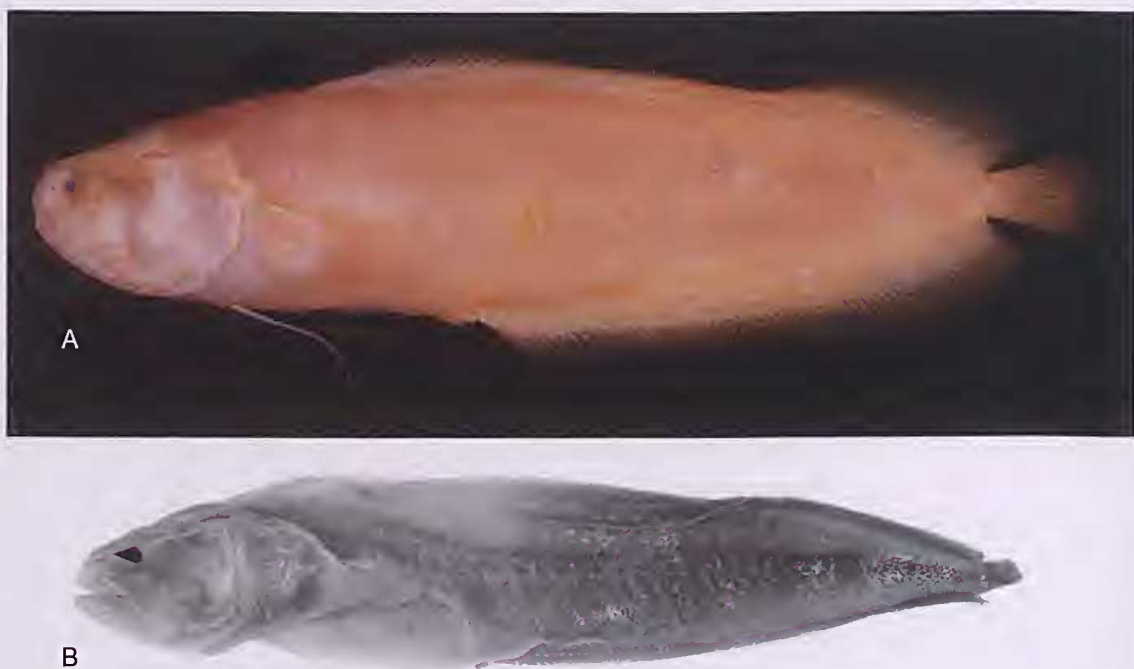


Fig. 31. *Dinematchthys ihuocoeteoides* Bleeker, 1855, A, fresh dead, BPBM 35594, female, 80 mm SL; B, neotype, BMNH 1862.2.28.65, male, 61 mm SL.

21 mm SL, Ogasawara Islands, Japan; BPBM 35594, 1 female, 80 mm SL, Seychelles; BPBM 38149, 3 males, 66, 71 and 102 mm SL and 2 females, 56 and 65 mm SL, Tonga; CAS 14255, 6 males, 41–83 mm SL, 6 females 50–102 mm SL, 7°14'32"N, 144°27'12"E, Ifalik Atoll, Micronesia, 0–4 m; CAS 35340, 13 female, 34–72 mm SL, 10 males, 28–60 mm SL, Maldives; CAS 35341, 19 males, 32–66 mm SL, 31 females, 29–66 mm SL, 1 juvenile, 23 mm SL,

Seychelles; CAS 227304, 1 male, 70 mm SL, Madang, Papua New Guinea; CAS 65665, 4 males, 50–75 mm SL, 1 female, 55 mm SL, Madang, Papua New Guinea; CAS 65669, 1 male, 67 mm SL and 2 females, 53 and 63 mm SL, Madang, Papua New Guinea; CAS 227289, 1 female, 76 mm SL, Madang, Papua New Guinea; CAS 227281, 1 male, 59 mm SL and 1 female, 64 mm SL, Kapingamarangi Atoll, Micronesia; CAS 227290, 1 female, 46 mm SL, Viti

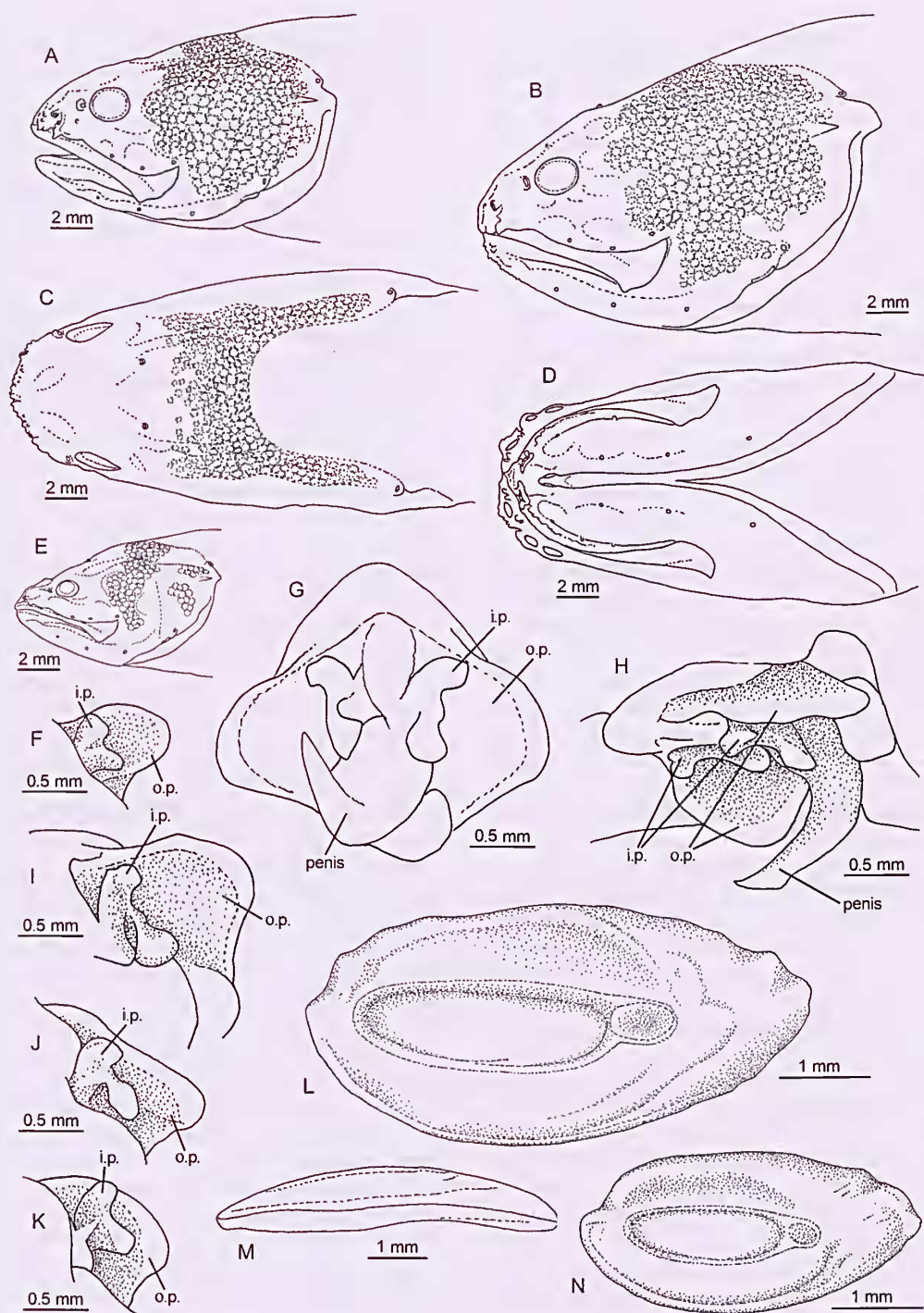


Fig. 32. *Dinematichthys ilucoeteoides* Bleeker, 1855, A, lateral view of head, BPBM 40937, female, 55 mm SL; B, lateral view of head, USNM 384592, male, 72 mm SL; C, dorsal view of head, USNM 384592, male, 72 mm SL; D, ventral view of head, USNM 384592, male 72 mm SL; E, lateral view of head, USNM 358342, male, 36 mm SL; F, view of left pseudoclasps from inside, holotype; G, ventral view of male copulatory organ, BPBM 35276, 74 mm SL; H, inclined lateral view of male copulatory organ, BPBM 35276, 74 mm SL; I, view of left pseudoclasps from inside, BPBM 35276, 74 mm SL; J, view of left pseudoclasps from inside, USNM 319902, male, 71 mm SL; K, view of left pseudoclasps from inside, SMNS 22544, 52 mm SL; L, median view of right otolith, USNM 199680, male, 78 mm SL; M, ventral view of right otolith, USNM 199680, male, 78 mm SL; N, median view of right otolith, WAM P.31213-007, female, 52 mm SL.

Levu north, Fiji; CAS 222534, 2 females, 58 and 63 mm SL, Fiji; CAS 222535, 2 females, 24 and 48 mm SL, Fiji; CAS 222539, 4 females, 55–68 mm SL, Fiji; CAS 222541, female 70 mm SL, Fiji; CAS 227292, 1 female 65 mm SL, Fiji; CAS 222546, 2 males, 41 and 64 mm SL, 1 female, 43 mm SL, Fiji; CAS 222548, 2 males, 52 and 58 mm SL, 4 females, 41–70 mm SL, 4 juveniles, 15–26 mm SL, Fiji; CAS 222549, 1 male, 60 mm SL, 4 females, 43–65 mm SL, Fiji; CAS 222557, 1 male, 74 mm SL, Fiji; CAS 222560, 1 male, 58 mm SL, 1 female, 55 mm SL, Fiji; CAS 222562, 2 males, 47 and 76 mm SL, 1 female with embryos, 50 mm SL, Fiji; CAS 222564, 1 male, 49 mm SL, Fiji; CAS 222568, 1 female, 45 mm SL, Fiji; CAS 227306, 1 male, 60 mm SL, Fiji; CAS 227287, 3 males, 38, 45 and 75 mm SL, 11 female, 40–73 mm SL, 2 juveniles, 19 and 23 mm SL, Fiji; CAS 222573, 2 females, 58 and 74 mm SL, Fiji; CAS 222574, 1 female, 38 mm SL, Fiji; CAS 222575, 1 male, 52 mm SL, 2 females, 41 and 73 mm SL, Fiji; CAS 222577, 3 females, 30–72 mm SL, 2 juveniles, 18 and 22 mm SL, Fiji; CAS 222578, male, 47 mm SL, Fiji; CAS 222579, 1 male, 53 mm SL, Fiji; CAS 222580, 1 female, 50 mm SL, Fiji; CAS 222581, 1 female, 52 mm SL, Fiji; CAS 222587, 1 male, 78 mm SL, 1 female, 32 mm SL, Fiji; CAS 222591, female, 86 mm SL, Fiji; CAS 222591, female, 86 mm SL, Fiji; CAS 227308, 2 females, 57 and 59 mm SL, Fiji; CAS 222593, 2 males, 36–52 mm SL, 3 females, 32–51 mm SL, Fiji; CAS 222597, 8 females, 35–82 mm SL, Fiji; CAS 222599, 4 males, 48–75 mm SL, 3 females, 65–75 mm SL, Fiji; CAS 222600, 2 males, 78 and 87 mm SL, 1 female, 78 mm SL, Fiji; CAS 227296, 1 male, 48 mm SL, Fiji; CAS 222602, 4 females, 61–80 mm SL, Fiji; CAS 222603, 1 male, 81 mm SL, 6 females, 65–90 mm SL, Fiji; CAS 227309, 4 males, 51–83 mm SL, 2 females, 65–73 mm SL, Fiji; CAS 227300, 1 female, 82 mm SL, Fiji; CAS 222609, 2 females, 61 and 80 mm SL, 8 juveniles, 14–33 mm SL, Fiji; CAS 222611, 4 females, 35–72 mm SL, 2 males, 44–86 mm SL, 4 juveniles, 20–25 mm SL, Fiji; CAS 222610, 1 male, 53 mm SL, 1 female, 73 mm SL, Fiji; CAS 222615, 2 females, 60 and 80 mm SL, Fiji; CAS 222617, 2 females, 49–75 mm SL, 2 males, 44 and 50 mm SL, Fiji; CAS 222620, 2 females, 39 and 75 mm SL, Fiji; CAS 227302, 2 females, 65 and 75 mm SL, Fiji; CAS 222624, 1 male, 75 mm SL, Fiji; CAS 222627, 1 male, 81 mm SL, Fiji; CAS 222634, 2 males, 59 and 85 mm SL, 1 juvenile, 19 mm SL; CAS 222639, 1 female, 60 mm SL, 1 male, 58 mm SL, Fiji; KAUM-I. 10660, 1 male, 42 mm SL, Okinoerabu Island, Kagoshima, Japan; MNHN 1965-0431, 2 females, 54 and 70 mm SL, 23°20'0"S, 43°31'0"E, Madagascar; MNHN 1977-0893, 1 female, 42 mm SL, 29°15'0"N, 34°45'0"E, Gulf of Aqaba, Israel; MNHN 1980-0243, 1 female, 90 mm SL, 22°26'0"S, 166°26'0"E, New Caledonia; MNHN 1980-0563, 1 male, 112 mm SL, 17°30'0"S, 167°30'0"E, Pleiades Nord, Loyalty Islands, 15–17 m; EX MNHN 1980-0851, 1 male, 100 mm SL, 1 female, 66 mm SL, 17°30'0"S, 167°30'0"E, Ile Solitaire, off Nouméa, New Caledonia; NTM S.13676-031, 2 females,

58 and 70 mm SL, 05°10'S, 145°50'3"E, Tab Island, Madang, Papua New Guinea, 15–24 m; ROM 37811, 3 males, 50, 50 and 60 mm SL, 05°25'21"S, 071°46'52"E, Isle du Coin, Chagos Archipelago; ROM 37812, 22 males, 30–81 mm SL, 18 females, 33–68 mm SL, 3 juveniles, 20–24 mm SL, 05°25'00"S, 071°46'00"E, Isle du Anglaise, Chagos Archipelago; ROM 42314, 1 female, 42 mm SL, 1 male, 48 mm SL, 09°28'00"S, 159°49'00"E, Honiara, Solomon Islands; ROM 50299, female, 42 mm SL, male 40 mm SL, 09°28'00"S, 159°42'00"E, 10 km W of Honiara, Solomon Islands; ROM 55144, 63 male, 09°12'16"S, 123°27'15"E, Tonga Point, Philippines; ROM 58267, 6 females, 32–53 mm SL, 5 males, 32–58 mm SL, 2 juveniles, 25 and 25 mm SL, 12°23'52"S, 43°30'00"E, Point Chongochahari, Comoros; ROM 68122, 4 females, 28–65 mm SL, 3 juveniles, 12–22 mm SL, 12°23'52"S, 43°30'00"E, Chissioua Dzaha, Comoros; SAIAB 35108, male, 63 mm SL, female, 54 mm SL, 22°00'N, 120°45'E, Wanlitong, Taiwan; SAIAB 53381, 2 females, 27 and 41 mm SL, 16°18'N, 119°54'E, Luzon, Bolinao, Philippine Islands; SMNS 13691, 2 females, 61 and 72 mm SL, 27°41'30"N, 34°08'10"E, Ras Mohammed, Red Sea, 0.5–4.5 m; SMNS 17126, 1 female, 28 mm, SL, 19°40'23"S, 63°25'58"E, Rodrigues Island, Mascarene Islands, 0.3–0.9 m; SMNS 17206, 4 females, 40–48 mm SL, 3 males, 39–87 mm SL, 19°40'25"S, 63°25'59"E, Rodrigues Island, Mascarene Islands, 0–2 m; SMNS 18674, 2 males, 59–62 mm SL, 1 female, 80 mm SL, 08°22'06"S, 116°04'46"E, Lombok, Indonesia, 1.5–3.8 m; SMNS 22544, 1 male, 54 mm SL, 29°09'44"S, 34°41'34"E, Gulf of Aqaba, Red Sea, 0–3 m; TAU 11692, 2 females, 46 and 51 mm SL, 4 males, 42–56 mm SL, Seychelles; TAU 11808, 1 male, 70 mm SL, 1 female, 52 mm SL, Seychelles; TAU 11830, 3 specimens, Seychelles; UF 173089, 1 females, 81 mm SL, 1 male, 55 mm SL, Enewetak Atoll, Marshall Islands; USNM 376199, 1 female, 53 mm SL, Buru Island, Indonesia; USNM 99066, 1 female, 55 mm SL, Cagayanes, Philippines; USNM 99223, 1 female, 34 mm SL, Ragay Gulf, Philippines; USNM 99226, 1 male, 63 mm SL, Dalaganem, Philippines; USNM 133865, 1 male, 80 mm SL, Tahiti; USNM 142011, 2 females, 62–68 mm SL, Rongelap Atoll, Marshall Islands; USNM 142016, 1 male, 82 mm SL, Bikini Atoll, Marshall Islands; USNM 374223, 1 male and 1 female, 46–85 mm SL, Bikini Atoll, Marshall Islands; USNM 142019, 4 specimens, 89–108 mm SL, Bikini Atoll, Marshall Islands; USNM 374224, 1 female, 91 mm SL, Bikini Atoll, Marshall Islands; USNM 166807, 2 males and 2 females, 60–82 mm SL, Arno Atoll, Marshall Islands; USNM 376193, 3 females, 52–80 mm SL, Onotoa, Gilbert Islands, Kiribati; USNM 199680, 5 females, 52–65 mm SL, 5 males, 40–83 mm SL, 12°10'S, 44°23'E, Comoros; USNM 206304, 25 specimens, 34–83 mm SL, Saint Anne Island, Seychelles; USNM 201252, 1 male, 42 mm SL, Ambon, Maluku Islands, Indonesia; USNM 394973, 3 females, 31–71 mm SL, Tutuila, Samoa; USNM 223324, 2 specimens, 22–38 mm SL, Pohnpei, Micronesia;

- USNM 223412, 6 specimens, 37–62 mm SL, Pohnpei, Micronesia; USNM 223426, 1 female, 63 mm SL, Pohnpei, Micronesia; USNM 223508, 14 specimens, 25–81 mm SL, Pohnpei, Micronesia; USNM 223558, 3 specimens, 60–80 mm SL, Pohnpei, Micronesia; USNM 224330, 5 specimens, 28–75 mm SL, Pohnpei, Micronesia; USNM 224331, 5 specimens, 23–77 mm SL, Pohnpei, Micronesia; USNM 244012, 1 male, 77 mm SL, 1 female, 32 mm SL, 17°45'S, 177°04'W, Malolo Island, Fiji; USNM 244013, 1 male and 4 females, 24–63 mm SL, Malolo Island, Fiji; USNM 263660, 21 specimens, 20–75 mm SL, Lemus, Kavieng, Papua New Guinea; USNM 263667, 5 specimens, 30–65 mm SL, Red Sea; USNM 263668, 1 female, 50 mm SL, Marshall Islands; USNM 263673, 7 specimens, 40–86 mm SL, 16°21'S, 43°59'E, Madagascar; USNM 377198, 15 specimens, 45–83 mm SL, 01°33'S, 144°59'E, Papua New Guinea, 0–15 m; USNM 377209, 1 male and 1 female, 53–64 mm SL, 10°52'N, 120°56'E, Palawan, Philippines, 0–14 m; USNM 377191, 1 female, 58 mm SL, 08°51'N, 123°24'E, Zamboanga, Philippines; USNM 263692, 15 specimens, 51–80 mm SL, 09°10'N, 123°26'E, Negros, Philippines, 0–3 m; USNM 377200, 3 males and 4 females, 38–82 mm SL, Weligama, Sri Lanka; USNM 263708, 1 specimen, 56 mm SL, Vuro Island, Fiji; USNM 263712, 27 specimens, 27–75 mm SL, 10°30'S, 44°21'E, Comores; USNM 263750, 12 specimens, 22–71 mm SL, Kiriwina, Papua New Guinea; USNM 263756, 18 specimens, 39–83 mm SL, Bougainville, Solomon Islands; USNM 267192, 4 specimens, 17–58 mm SL, Seychelles; USNM 394974, 4 males, 27–36 mm SL, 2 females, 42 and 43 mm SL, Mahe, Seychelles; USNM 300092, 2 males and 1 female, 44–69 mm SL, 20°24'N, 121°55'E, Batanes, Philippines; USNM 300094, 1 female, 21°07'N, 121°56'E, Batanes, Philippines; USNM 300100, 1 female, 20°17'N, 121°50'E, Batanes, Philippines; USNM 300103, 1 male, 50 mm SL, 22°54'N, 121°54'E, Batanes, Philippines; USNM 374228, 1 male, 57 mm SL, 04°52'N, 119°26'E, Sibutu, Philippines; USNM 319898, 1 female, 78 mm SL, 20°34'S, 166°14'E, Loyalty Islands, New Caledonia, 0–5 m; USNM 319902, 2 males 50 and 71 mm SL, 5 females, 20°34'S, 166°14'E, Loyalty Islands, New Caledonia; USNM 334123, 20 specimens, 26–89 mm SL, Tongatapu, Tonga; USNM 334125, 9 specimens, 28–75 mm SL, Tongatapu, Tonga; USNM 334126, 2 specimens, 23–93 mm SL, Tongatapu, Tonga; USNM 334127, 13 specimens, Tongatapu, Tonga; USNM 374209, 11 specimens, 35–79 mm SL, 21°20'S, 174°58'W, Tonga; USNM 336510, 9 specimens, 19°16'S, 174°22'W, Tonga; USNM 338465, 4 females, 31–98 mm SL, Vava'u Group, Tonga; USNM 394977, 6 specimens, 54–67 mm SL, 18°44'31"S, 174°06'36"W, Vava'u Group, Tonga; USNM 377199, 5 specimens, 42–75 mm SL, 10°35'N, 122°08'E, Panay, Philippines; USNM 376156, 1 female, 47 mm SL, 10°28'N, 122°28'E, Guimaraes, Philippines; USNM 394983, 5 females, 43–72 mm SL, 1 male, 58 mm SL, 16°47'13"S, 168°21'36"E, Epi, Vanuatu, 1–10 m; USNM 352643, 6 specimens, 52–55 mm SL, Ryukyu Islands; USNM 355820, 1 male and 1 female, 40–66 mm SL, Papua New Guinea; USNM 357210, 1 juvenile, 23 mm SL, 10°40'S 165°47'E, Solomon Islands; USNM 358342, 1 male, 36 mm SL, 10°16'S, 166°18'E, Solomon Islands; USNM 384592, 1 female, 63 mm SL, 1 male, 72 mm SL, Vanuatu, Efate; USNM 363675, 1 female, 79 mm SL, Vanuatu; USNM 363908, 2 females, 60–88 mm SL, 15°00'S, 168°03'E, Maewo, Vanuatu; USNM 365322, 1 male and 1 female, 80–102 mm SL, 08°23'S, 162°51'E, Stewart Island, Solomon Islands; USNM 365613, 4 specimens, 42–57 mm SL, 13°21'30"S, 176°10'10"W, Wallis Island, Wallis and Futuna Islands, 1–13 m; USNM 377236, 2 males, 41–80 mm SL, Bugabag, Papua New Guinea; USNM 365823, 4 specimens, 42–75 mm SL, Hermit Island, Papua New Guinea; USNM 365826, 7 specimens, 58–66 mm SL, Hermit Island, Papua New Guinea; USNM 365829, 1 female, 37 mm SL, Massas, Papua New Guinea; USNM 366216, 6 specimens, 51–83 mm SL, Chagos Archipelago; USNM 366227, 3 females, 25–50 mm SL, 27°16'N, 33°47'E, Egypt; USNM 366228, 1 male, 45 mm SL, 26°08'N, 34°16'E, Egypt; USNM 366229, 1 female, 68 mm SL, 27°18'N, 33°47'E, Egypt; USNM 366230, 1 male and 1 female, 40–60 mm SL, Mauritius; USNM 366231, 2 juveniles, 17–26 mm SL, 16°25'S, 59°36'E, Cargados Carajos, Mascarene Islands; USNM 366232, 3 females, 38–68 mm SL, 16°43'S, 59°35'E, Cargados Carajos, Mascarene Islands; USNM 366233, 7 specimens, 35–65 mm SL, 16°27'S, 59°36'E, Cargados Carajos, Mascarene Islands; USNM 366234, 9 males and 24 females, 31–70 mm SL, 10°19'S, 56°35'E, Agalega, Mauritius; USNM 366457, 2 specimens, Agalega, Mauritius; USNM 366459, 8 males and 4 females, 32–86 mm SL, 07°15'S, 72°22'E, Chagos Archipelago; USNM 366460, 1 male, 54 mm SL, 07°15'S, 72°22'E, Chagos Archipelago; USNM 366461, 5 males and 8 females, 42–84 mm SL, 07°15'S, 72°22'E, Chagos Archipelago; USNM 366462, 1 female, 45 mm SL, 13°49'S, 72°24'E, Chagos Archipelago; USNM 366463, 2 females, 57–60 mm SL, 07°14'S, 72°23'E, Chagos Archipelago; USNM 366464, 3 males and 2 females, 39–69 mm SL, 07°20'S, 72°27'E, Chagos Archipelago; USNM 366465, 5 males and 1 female, 40–59 mm SL, Marsa Mokrakh, Egypt; USNM 366466, 4 females, 27–41 mm SL, Egypt; USNM 366467, 1 female, 68 mm SL, Hikkaduwa, Sri Lanka; USNM 366468, 6 specimens, 40–82 mm SL, Hikkaduwa, Sri Lanka; USNM 366469, 1 male, 72 mm SL, Hikkaduwa, Sri Lanka; USNM 366472, 33 specimens, 22–92 mm SL, Egypt; USNM 376219, 6 males and 1 female, 21–65 mm SL, 05°52'S, 112°37'E, Java, Bawacan Island; USNM 366476, 47 specimens, 16°28'S, 59°40'E, Cargados Carajos, Mascarene Islands; USNM 366477, 1 male, 71 mm SL, Hikkaduwa, Sri Lanka; USNM 366478, 1 male and 1 female, 71–84 mm SL, Galle, Sri Lanka; USNM 366479, 1 female, 60 mm SL, Hikkaduwa, Sri Lanka; USNM 366483, 1 female, 58 mm SL, 07°14'S, 72°23'E, Chagos Archipelago; USNM 366484, 2 females, 42–57 mm SL, 07°20'S, 72°27'E,

Chagos Archipelago; USNM 366485, 2 males and 6 females, 44–67 mm SL, 07°13'S, 72°25'E, Chagos Archipelago; USNM 366486, 1 female, 84 mm SL, 07°14'S, 72°23'E, Chagos Archipelago; USNM 366487, 1 male and 4 females, 44–69 mm SL, 07°16'S, 72°28'E, Chagos Archipelago; USNM 366491, 1 female, 41 mm SL, 02°50'N, 95°56'E, Sumatra; USNM 366492, 3 males, 35–67 mm SL, 04°14'S, 152°10'E, Bismarck Archipelago, Papua New Guinea; USNM 376220, 1 male, 65 mm SL, 03°47'S, 128°06'E, Maluku, Indonesia; USNM 376200, 1 female, 39 mm SL, 05°52'S, 110°25'E, Karimundjawa, Java, Indonesia; USNM 366500, 1 male and 7 females, 39–75 mm SL, 05°51'S, 106°34'E, Pulau Seribu, Indonesia; USNM 366501, 19 specimens, 16–48 mm SL, 01°33'S, 144°59'E, Papua New Guinea; USNM 376205, 5 specimens, 48–74 mm SL, Madang, Papua New Guinea; USNM 366504, 3 specimens, Madang, Papua New Guinea; USNM 366506, 1 male and 3 females, 68–87 mm SL, Briwadi Island, Kiriwina Islands (Trobriand), Papua New Guinea; USNM 376162, 31 specimens, 07°15'S, 72°22'E, Chagos Archipelago; USNM 366513, 1 juvenile, 29 mm SL, Buroa, Egypt; USNM 366514, 1 female, 61 mm SL, 15°32'N, 40°00'E, Ethiopia; USNM 366515, 14 specimens, 15–67 mm SL, Gulf of Aqaba, Egypt; USNM 366516, 1 female, 74 mm SL, Buroa, Egypt; USNM 366517, 2 males and 1 female, 43–71 mm SL, Sinai, Egypt; USNM 366519, 4 females, 41–58 mm SL, 16°28'S, 59°37'E, Cargados Carajos, Mascarene Islands; USNM 366520, 15 specimens, 34–67 mm SL, North Island, Agalega, Mauritius; USNM 376201, 10 specimens, 34–69 mm SL, 05°10'S, 145°51'E, Papua New Guinea; USNM 366523, 1 female, 61 mm SL, Madang, Papua New Guinea; USNM 376191, 1 female, 45 mm SL, Madang, Papua New Guinea; USNM 366526, 13 specimens, 39–61 mm SL, Kiriwina Islands (Trobriand), Papua New Guinea; USNM 366527, 11 specimens, 59–91 mm SL, 12°46'N, 44°59'E, Aden; USNM 366529, 3 specimens, 12°53'S, 45°16'E, Comores; USNM 366534, 4 specimens, 07°56'N, 81°34'E, Sri Lanka; USNM 366535, 21 specimens, 26–75 mm SL, 05°24'S, 53°13'E, Comores; USNM 366551, 5 specimens, 27–47 mm SL, Israel; USNM 366552, 22 specimens, 11–98 mm SL, Gulf of Aqaba, Egypt; USNM 366553, 13 specimens, 51–72 mm SL, 15°30'N, 39°54'E, Ethiopia; USNM 366571, 1 male, 54 mm SL, Guadalcanal, Solomon Islands; USNM 366573, 1 male, 73 mm SL, New Georgia, Solomon Islands, USNM 366590, 20 specimens, 30–80 mm SL, 16°36'S, 59°31'E, Cargados Carajos, Mascarene Islands; USNM 366591, 31 specimens, 28–75 mm SL, 16°26'S, 59°36'E, Cargados Carajos, Mascarene Islands; USNM 366593, 30 specimens, 28–74 mm SL, 16°25'S, 59°36'E, Cargados Carajos, Mascarene Islands; USNM 366594, 5 specimens, 35.81 mm SL, 16°15'S, 59°33'E, Cargados Carajos, Mascarene Islands; USNM 374229, 1 female, 51 mm SL, 09°13'N, 123°28'E, Negros, Philippines; USNM 374225, 1 male, 66 mm SL, 09°31'N, 123°40'E, Philippines; USNM 366679, 1 female, 86 mm SL, Kwajalein Atoll, Marshall Islands;

USNM 366692, 2 females, 68–72 mm SL, 21°55'N, 120°50'E, Taiwan; USNM 366693, 2 specimens, 48–64 mm SL, 21°55'N, 120°48'E, Taiwan; USNM 366697, 20 specimens, 37–74 mm SL, Red Sea; USNM 366701, 1 specimen, 47 mm SL, 09°03'N, 123°07'E, Philippines; USNM 366702, 4 specimens, 27–43 mm SL, Bararin, Philippines; USNM 366704, 1 male, 49 mm SL, Tagauyan, Philippines; USNM 366720, 1 male, 55 mm SL, Balabac, Philippines; USNM 366721, 1 female, 44 mm SL, 11°42'S, 167°51'E, Vanikolo Islands, Santa Cruz Islands, Solomon Islands; USNM 366839, 7 specimens, 59–80 mm SL, 18°08'S, 178°24'E, Fiji; USNM 366840, 1 male, 78 mm SL, 19°09'S, 179°45'E, Fiji; USNM 366842, 6 specimens, 45–77 mm SL, 18°58'S, 179°52'W, Fiji; USNM 366844, 4 specimens, 55–76 mm SL, 21°38'S, 178°45'W, Fiji; USNM 366845, 6 males and 1 female, 44–81 mm SL, 18°55'S, 178°33'W, Fiji; USNM 366846, 6 specimens, 45–75 mm SL, 18°57'S, 178°17'E, Fiji; USNM 376206, 6 specimens, 40–111 mm SL, 17°06'S, 177°13'E, Fiji; USNM 374208, 3 females, 32–60 mm SL, 13°23'S, 176°11'W, Wallis Island, Wallis and Futuna Islands; USNM 263698, 1 female, 57 mm SL, 01°33'S, 144°59'E, Papua New Guinea; WAM P.27469-005, 5 males, 65–70 mm SL, 15°50'S, 145°50'E, Escape Reef, Queensland, Australia; WAM P.27663-003, 2 males 65 and 65 mm SL, 1 female, 35 mm SL, NW Australia; WAM P.27825-031, 2 males, 35 and 42 mm SL, 2 females, 39 and 44 mm SL, Bismarck Sea, Papua New Guinea; WAM P.28191-005, 1 male, 52 mm SL, Coral Sea; WAM P.29627-048, 2 females, Coral Sea; WAM P.29642-010, 2 females, 42–53 mm SL, Coral Sea; WAM P.30618-002, 1 male and 3 females, 67–79 mm SL, Papua New Guinea; WAM P.30633-023, 1 male, 58 mm SL, Papua New Guinea; WAM P.30719-036, 1 female, 42 mm SL, Flores Sea, Indonesia; WAM P.30791-002, 1 female, 50 mm SL, New Caledonia; WAM P.30844-050, 3 specimens, Timor Sea; WAM P.31213-058, 1 female, 52 mm SL, Papua New Guinea; WAM P.31437-043, 1 male, 60 mm SL, Timor Sea; YCM-P 34028, 1 male, 54 mm SL, Kakeroma Island, northern Ryukyu Islands, Japan; ZMUC P 771654-56, 2 males, 66 and 85 mm SL and 1 female, 77 mm SL, Seychelles; ZMUC P 771657-58, 1 male, 61 mm SL, and 1 female, 56 mm SL, Mauritius.

Diagnosis. Vertebrae 10–12+30–34=41–45, dorsal fin rays 75–92, anal fin rays 59–71; eyes large (2.2–3.3% SL); body moderately slender, snout with many cirri; head continuously covered with scales, ventrally terminating behind maxilla; upper preopercular pore absent; outer pseudoelasper broad-based, small, not extending beyond hood in resting position; inner pseudoelasper small, with two lobes; otolith length to height 2.1–2.3 with regularly curved dorsal rim, otolith length to sulcus length 1.6–1.7, ostium length to cauda length 3.8–4.8.

Description (Figs 31, 32). The principal meristic and morphometric characters are shown in Table 13. Mature at about 45 mm SL. Body slender, with moderately pointed head profile. Many cirri on snout. Eye size 2.2–3.3 (2.8)%

SL. Head continuously covered with scales on cheeks, opercle and occiput, ventrally terminating behind maxilla. Horizontal diameter of scales on body of 85 mm SL male (ZMUC P771656) about 2.0% SL, in about 28 horizontal rows. Maxillary ending far behind eye, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end expanded with little knob. Anterior nostril positioned high, 1/2–1/2.5 distance from upper lip to anterior margin of eye. Posterior nostril small, about one-fifth to one-sixth the size of eye. Opercular spine with free tip, pointed. Anterior gill arch with 13–19 (15) rakers, 3 elongate in a row. Pseudobranchial filaments 2.

Head sensory pores (Fig. 32A–E). Supraorbital pores 2–3. Infraorbital pores 6 (3 anterior and 3 posterior), three posterior pores about one-third the size of three anterior pores. Mandibular pores 6 (3 anterior and 3 posterior): first anterior pore large, tubular, with cirrus anteriorly. Preopercular pores: 3 lower, first and second with joined opening, covered by dermal flap in lateral view, third tubular; no upper preopercular pore. [See description of *Alionematichthys ceylonensis* for position of pores.]

Dentition (of holotype). Premaxilla with 7 outer rows of granular teeth and 2 inner rows of larger teeth. Anteriormost teeth in inner row up to 3/4 diameter of pupil. Vomer horseshoe-shaped, with 3 outer rows of small teeth and 1 inner row of larger teeth up to 2/3 diameter of pupil. Palatine with 2 outer rows of small teeth and 1 inner row of larger teeth up to 1/2 diameter of pupil. Dentary with 5 outer rows of granular teeth and 1 inner row of larger teeth, up to about size of diameter of pupil.

Otolith (Fig. 32L–N). Elongate in shape, length to height 2.1–2.3 and moderately thin (otolith height to otolith thickness about 2.5). Anterior tip rounded, posterior tip slightly pointed, expanded. Dorsal rim shallow, gently curved. Inner face convex, outer face slightly concave to flat, both smooth. Otolith length to sulcus length 1.6–1.7. Sulcus medianly positioned, slightly inclined, with separated colliculi and small notch at ventral rim of sulcus at joint of ostium with cauda. Ostium length to cauda length 3.8–4.8. Ventral furrow weak, moderately close to ventral rim of otolith.

Axial skeleton. Neural spine of vertebra 4 inclined and 5–8 depressed. Parapophyses present from vertebrae 6 to 11 (10–12). Pleural ribs on vertebrae 2 to 11 (10–12). First anal fin pterygiophore not longer than subsequent pterygiophore.

Male copulatory organ (Fig. 32G–K). Two pairs of small pseudoclaspers, outer not extending beyond hood in resting position. Outer pseudoclasper broad based, simple flap-shaped; inner pseudoclasper about half length of outer pseudoclasper, with two lobes. Isthmus moderately narrow; penis curved, slightly longer than outer pseudoclaspers.

Colour. Live colour reported as to yellow or bright to red (Fig. 31A). Preserved colour mostly dark brown.

Variability and ontogeny. Despite the wide distribution of *D. ilnocoeteoides* there are few, if any, regional

variations to be observed. For instance, in life, colouration of specimens from the Western Indian Ocean is usually described as bright red while a record from the most north-eastern location at the Japanese Bonin Islands was reported as yellow (personal communication by J. E. Randall). Another character showing some variation is the amount of cirri on the snout, which appears to be denser in western Indian Ocean specimens than in western Pacific specimens. Specimens from furthest to the southwest (Vanuatu, Fiji, Tonga) are special for their generally somewhat higher meristic counts, both in vertebrae (43–45) as well as dorsal fin rays (84–92). Ontogenetic changes are most strongly expressed in the squamation of the head, which is continuous on cheeks, opercle and occiput in adults and subadults from about 40 mm SL. Smaller juvenile and larval specimens show some interruption of the scale coverage on the head, particularly between cheeks and opercle, while already complete between cheeks and occiput (Fig. 32E). The density of cirri on the snout also increases with growth, i.e. is absent in small specimens below 40 mm SL.

Remarks. Machida (1994) described *D. indicus* from the Chagos Archipelago and Comores Islands, i.e. from the central and western Indian Ocean and *D. randalli* from Kosrac, Micronesia. He distinguished *D. indicus* from *D. randalli* by the presence of cirri on the top and sides of the head behind the eye (vs no cirri on head) and by lower scale row counts (85–100 vs 107–113). In our review of more than 1000 specimens from an almost continuous geographical range, the main diagnostic character, i.e. presence or absence of cirri on the head could not be verified. It is true that western Pacific specimens appear to have generally fewer cirri, but we regard this character as too weak and too irregularly distributed to be of diagnostic value. Similarly, the scale row count is considered by us as a not sufficiently reliable character.

Distinction of these two species from *D. ilnocoeteoides* was based on comparative data from Bleeker (1855) and Sedor and Cohen (1987), with *D. ilnocoeteoides* and was described as having larger eyes (a little over 5 in head length / eye diameter vs 7.8–9.4) and having a sheathed maxillary (vs unsheathed). Again, in our evaluation the eye size differences are well within the variations observed, while we failed to recognise a difference of sheathed versus unsheathed maxillary in any of the specimens other than possibly caused by preservation. In consequence, all three nominal species are here regarded as representing a single valid species for which *D. ilnocoeteoides* is the senior synonym.

Comparison. *Dinematichthys ilnocoeteoides* is closely related to *D. trilobatus* sp. nov. (see below for differentiation of the two species). The head squamation continuing on the cheeks, opercle and occiput, which usually is easily visible without the removal of mucus, distinguishes *D. ilnocoeteoides* readily from any other co-occurring dinematichthyine species. Confusion may only be possible in the case of juveniles, which show some gaps

in head squamation between the cheeks and the opercle (Fig. 32E). Also, the absence of the upper preopercular pore and connection of the cheek squamation with the occiput squamation still allow a secure identification in most instances.

Distribution. *Dinematichthys iluocoeteoides* is the most widely distributed species of all *Dinematichthyini*, ranging from the western Indian Ocean (Red Sea, Arabian Gulf, East Africa) to the Ryukyu and Ogasawara Islands in the north-western Pacific and Marshall and Kiribati Islands, Fiji, Tonga and Samoa in the central and south-western Pacific (Fig. 30). The reason for its unusually wide distribution is unknown, but due to the low degree of regional variation (except for the sympatric *D. trilobatus* sp. nov. of the Christmas and Cocos Islands; see below) is likely to be of recent origin. Despite this wide distribution, *D. iluocoeteoides* usually does not occur in large numbers at most sampled locations, except for some areas in the western and central Indian Ocean, e.g. the Comores or the Chagos Archipelago. *Dinematichthys iluocoeteoides* is also notable for its strict association with true reef environments and particularly so with outer reefs and reef cores.

***Dinematichthys trilobatus* sp. nov.**

(Figs 30, 33, 34, Tables 1, 14)

Material examined. (16 specimens, 37–58 mm SL). HOLOTYPE – WAM P.29927-005, male, 46 mm SL, 12°05'S, 096°53'E, Direction Island, Cocos-Keeling Islands, 0.1–2.0 m, G. R. Allen, 24 Feb. 1989. PARATYPES – ANSP 162877, 49 mm SL, 12°06'30"S, 096°49'35"E; Turk Reef, Cocos-Keeling Islands, 45–49 m, W.F. Smith-Vaniz and P. L. Colin, 8 March 1974; WAM P.26106-012, male, 40 mm SL, 7 females, 45–57 mm SL, 10°29'S, 105°40'E, Rhonda Beach, Christmas Island, 10–12 m, G. R. Allen and R. Steene, 2 June 1978; WAM P.29002-021, males, 42, and 50 mm SL, female 58 mm SL, 10°25'S, 105°40'E, Kiritimati, 13–26 m, G. R. Allen and R. Steene, 28 June 1986; WAM P.29927-013, 3 females, 37, 37 and 38 mm SL, same data as the holotype.

Diagnosis. Vertebrae 11+31–32=42–43, dorsal fin rays 80–87, anal fin rays 60–67; eyes large (2.4–3.0% SL); body slender, snout with few cirri; head continuously covered with scales, ventrally extending beyond tip of maxilla forward of third posterior mandibular pore; upper preopercular pore absent; outer pseudoclasper broad-based, small, not extending beyond hood in resting position; inner pseudoclasper small, with three lobes; otolith length to height 2.1–2.2, with regularly curved dorsal rim, otolith length to sulcus length 1.7–1.8, ostium length to cauda length 3.7–4.2.

Description (Figs 33, 34). The principal meristic and morphometric characters are shown in Table 14. Mature at about 40 mm SL. Body slender, with pointed head profile. Few cirri on snout. Eye size 2.4–3.0 (2.8)% SL. Head continuously covered with scales on cheeks, opercle and occiput, ventrally extending beyond tip of maxilla forward

Table 14. Meristic and morphometric characters of *Dinematichthys trilobatus* sp. nov.

	Holotype WAM 29927- 005	Holotype + 15 paratypes	n
	Mean (range)		
Standard length in mm	46	47.4 (37–58)	16
Meristic characters			
Dorsal fin rays	87	82.6 (80–87)	15
Caudal fin rays	16	15.9 (15–16)	8
Anal fin rays	66	64.1 (60–67)	15
Pectoral fin rays	22	22.4 (21–24)	14
Precaudal vertebrae	11	11	15
Caudal vertebrae	32	31.7 (31–32)	15
Total vertebrae	43	42.7 (42–43)	15
Rakers on anterior gill arch	15	15.4 (13–17)	14
Pseudobranchial filaments	2	2	13
D/V	6	6	14
D/A	22	22.0 (19–24)	14
V/A	13	13	14
Morphometric characters in % of SL			
Head length	26.5	27.1 (25.8–28.0)	13
Head width	15.0	13.7 (12.7–16.6)	13
Head height	17.0	16.5 (15.6–17.5)	13
Snout length	5.3	5.9 (4.9–6.9)	13
Upper jaw length	13.4	14.0 (12.9–15.0)	13
Diameter of pigmented eye	2.8	2.7 (2.4–3.0)	13
Diameter of pupil	1.7	1.8 (1.5–2.6)	13
Interorbital width	6.2	6.9 (6.2–7.9)	13
Posterior maxilla height	4.5	4.5 (4.1–4.8)	13
Postorbital length	18.8	19.0 (17.8–19.8)	13
Precanal length	49.1	45.8 (42.6–49.1)	13
Predorsal length	30.1	31.1 (30.1–32.2)	13
Body depth at origin of anal fin	16.9	17.6 (15.7–20.0)	13
Pectoral fin length	14.6	14.8 (12.5–16.4)	13
Pectoral fin base height	5.9	6.3 (5.8–7.2)	13
Ventral fin length	23.5	23.6 (20.9–26.1)	11
Base ventral fin - anal fin origin	27.2	25.7 (23.7–27.5)	13

of third posterior mandibular pore. Horizontal diameter of scales on body about 1.3% SL, in 27 horizontal rows. Maxillary ending far behind eye, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end expanded with little knob. Anterior nostril positioned high, 1/2.5 distance from upper lip to anterior margin of eye. Posterior nostril small, about 1/6 the size of eye. Opercular spine with free tip, pointed. Anterior gill arch with 13–17 (15) rakers, 3 elongate in a row. Pseudobranchial filaments 2.

Head sensory pores (Fig. 34A–C). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior), three posterior pores about one-third size of three anterior pores. Mandibular pores 6 (3 anterior and 3 posterior): first anterior pore large, tubular. Preopercular pores: 3 lower, first and second with joined opening, covered by dermal flap in lateral view; third tubular; no upper preopercular



Fig. 33. *Dinematchthys trilobatus* sp. nov., WAM P.29927-005, holotype, male, 46, mm SL.

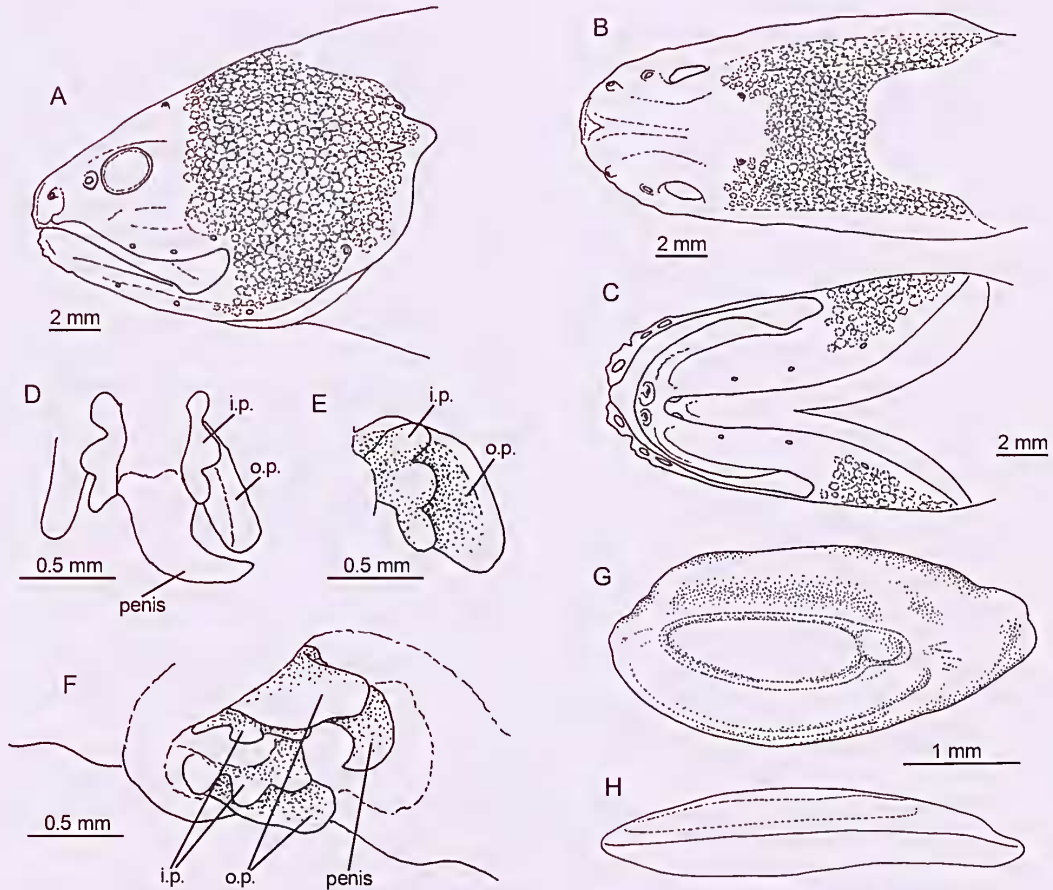


Fig. 34. *Dinematchthys trilobatus* sp. nov., A, lateral view of head, WAM P.29002-021, female, 58 mm SL; B, dorsal view of head, WAM P.26106-012, female, 57 mm SL; C, ventral view of head, WAM P.26106-012, female, 57 mm SL; D, ventral view of male copulatory organ, WAM P.29002-021, male, 42 mm SL; E, view of left pseudoelaspers from inside, holotype; F, inclined lateral view of male copulatory organ, WAM P.29002-021, 42 mm SL; G, median view of right otolith, WAM P.29002-021, male, 42 mm SL; H, ventral view of right otolith, WAM P.29002-021, male, 42 mm SL.

pore. [See description of *Alionematchthys ceylonensis* for position of pores.]

Dentition (of holotype). Premaxilla with 6 outer rows of granular teeth and 1 inner row of larger teeth. Anteriormost teeth in inner row up to $1/3$ diameter of pupil. Vomer horseshoe-shaped, with 2 outer rows of small teeth and 1 inner row of larger teeth up to $1/4$ diameter of pupil. Palatine

with 1 outer row of small teeth and 1 inner row of larger teeth up to $1/4$ diameter of pupil. Dentary with 3 outer rows of granular teeth and 1 inner row of larger teeth, up to about $1/2$ diameter of pupil.

Otolith (Fig. 34G, H). Elongate in shape, length to height 2.1–2.2 and moderately thin (otolith height to otolith thickness about 2.3). Anterior tip slightly pointed, posterior

tip pointed, expanded. Dorsal rim shallow, gently curved. Inner face convex, outer face slightly concave to flat, both smooth. Otolith length to sulcus length 1.7–1.8. Sulcus medianly positioned, slightly inclined, with separated colliculi and marked notch at ventral rim of sulcus at joint of ostium with cauda. Ostium length to cauda length 3.7–4.2. Ventral furrow weak, moderately close to ventral rim of otolith.

Axial skeleton. Neural spine of vertebra 4 inclined and 5–8 depressed. Parapophyses present from vertebrae 6 to 11. Pleural ribs on vertebrae 2 to 11. First anal fin pterygiophore not longer than subsequent pterygiophore.

Male copulatory organ (Fig. 34D–F). Two pairs of small pseudoclaspers, the outer not extending beyond hood in resting position. Outer pseudoclasper broad based, simple flap-shaped; inner pseudoclasper about half the length of outer pseudoclasper, with three lobes. Isthmus moderately wide; penis curved, about as long as outer pseudoclaspers.

Colour. Live colour unknown. Preserved colour light brown.

Comparison. *Dinematichthys trilobatus* obviously is closely related to *D. ihuocoeteoides*, from which it differs mainly in the shape of the inner pseudoclasper with three distinct lobes (vs two), the more expanded head squamation ventrally extending beyond tip of maxilla forward of third posterior mandibular pore, and and only few cirri on the snout (vs many cirri).

Distribution. *Dinematichthys trilobatus* is endemic to the Christmas and Cocos-Keeling Islands, where it replaces the widespread *D. ihuocoeteoides* (Fig. 30). *Dinematichthys trilobatus* represents the only dinematichthyine known from the Christmas and Cocos Islands and its specific separation from the widespread *D. ihuocoeteoides* indicates a prolonged separation history for the fauna of these islands, or a perhaps a colonisation event with subsequent speciation.

Etymology. Named for the inner pseudoclasper with three lobes: *trilobatus* (Latin = three lobed). It is an adjective.

Porocephalichthys gen. nov.

Type species: *Dinematichthys dasyrhynchus* Cohen and Hutchins, 1982 (type locality Rottneest Island, Western Australia). Gender masculine.

Dinematichthys (non Bleeker, 1855) in part. — Cohen and Nielsen 1978; Cohen and Hutchins 1982; Machida 1994. Nielsen *et al.* 1999.

Diagnosis. Genus of Dinematichthyini with following combination of characters: anterior nostril placed high on snout at about 1/2.5 the distance from lip to anterior rim of eye; head completely and continuously covered with scales on cheeks, opercle and occiput; abundant cirri on snout; male copulatory organ with two pairs of equally long pseudoclaspers; outer pseudoclasper a simple flap, inner pseudoclasper inwardly curved stick-like; size up to 100 mm SL; precaudal vertebrae 14, total vertebrae

47–49, dorsal fin rays 96–104, caudal fin rays 17–18, anal fin rays 62–69, V in D 2.3; upper preopercular pore present; four additional pairs of supraorbital pores, one pair above and in front of eyes, a second above and behind eyes, two more pairs of pores on occiput in prolongation of upper preopercular pore; one or two additional posterior mandibular pores; jaws without canine teeth; no elongate gill rakers; sulcus of otolith with cauda nearly of the length of ostium.

Comparison. When originally described, the species was tentatively placed in the genus *Dinematichthys*. Cohen and Hutchins (1982, p. 342) wrote: "Differences between the two are numerous and when more species are described and specimens of the true *D. ihuocoeteoides* are re-collected and become available for study, it may be necessary to establish the Rottneest Island species in a separate genus". After having reviewed all Dinematichthyine genera, we are confident that *D. dasyrhynchus* should be placed in a separate genus. *Porocephalichthys* resembles *Dinematichthys* in the uniform and continuous head squamation including cheeks, opercle and occiput and in having the anterior nostril placed high on snout. The other characters of the diagnosis, such as the many additional pores, total lack of elongate gill-rakers, number of vertebrae, dorsal, caudal and pectoral fin rays (Table 1), and the proportions of the sulcus of the otolith and the pseudoclasper pattern, place *Porocephalichthys* well apart from *Dinematichthys* and any of the other dinematichthyine genera. The correct phylogenetic position of the genus needs further investigation.

Species. *Porocephalichthys* is a monospecific genus with *P. dasyrhynchus* endemic to SW Australia.

Etymology. Combined from *porocephalus* (Latin = head with pores) and *ichthys* (Greek = fish), referring to the many pores on the head. The gender is masculine.

Porocephalichthys dasyrhynchus (Cohen and Hutchins, 1982)

(Figs 30, 35, 36, Tables 1, 15)

Dinematichthys ihuocoeteoides. — Mees 1960: 18.

Dinematichthys sp. — Hutchins 1979: 93.

Dinematichthys dasyrhynchus Cohen and Hutchins, 1982: 342; Allen 1985: 2268, fig. 49; Paxton *et al.* 1989: 316; Nielsen *et al.* 1999: 130.

Material examined (9 specimens, 43–95 mm SL) (all from Western Australia). Paratypes: AMS I. 20245-016, 1 male, 64 mm SL, 2 females, 77–94 mm SL, Horseshoe Reef, Rottneest Island, 12–15 m, B. C. Russell and J. B. Hutchins; Non-types: WAM P.27950-011, 2 males, 61 and 64 mm SL, 30°18'S, 115°00'E, Jurien Bay, 4–6 m, N. Sinclair *et al.*, 9 April 1983; WAM P.27951-007, 1 female, 95 mm SL, 30°18'S, 115°00'E, Jurien Bay, Osprey Inlet, Western Australia, 2–5 m, J. B. Hutchins *et al.*, 10 April 1983; ZMUC P77716-18, 3 females, 43, 46 and 89 mm SL, 32°01'S, 115°29'E, Green Island, Rottneest Island, Western Australia, 10 April 1978.

Diagnosis. See generic diagnosis.



Fig. 35. *Porocephalichthys dasyrhynchus* (Cohen and Hutchins, 1982), ZMUC P77726, female, 89 mm SL.

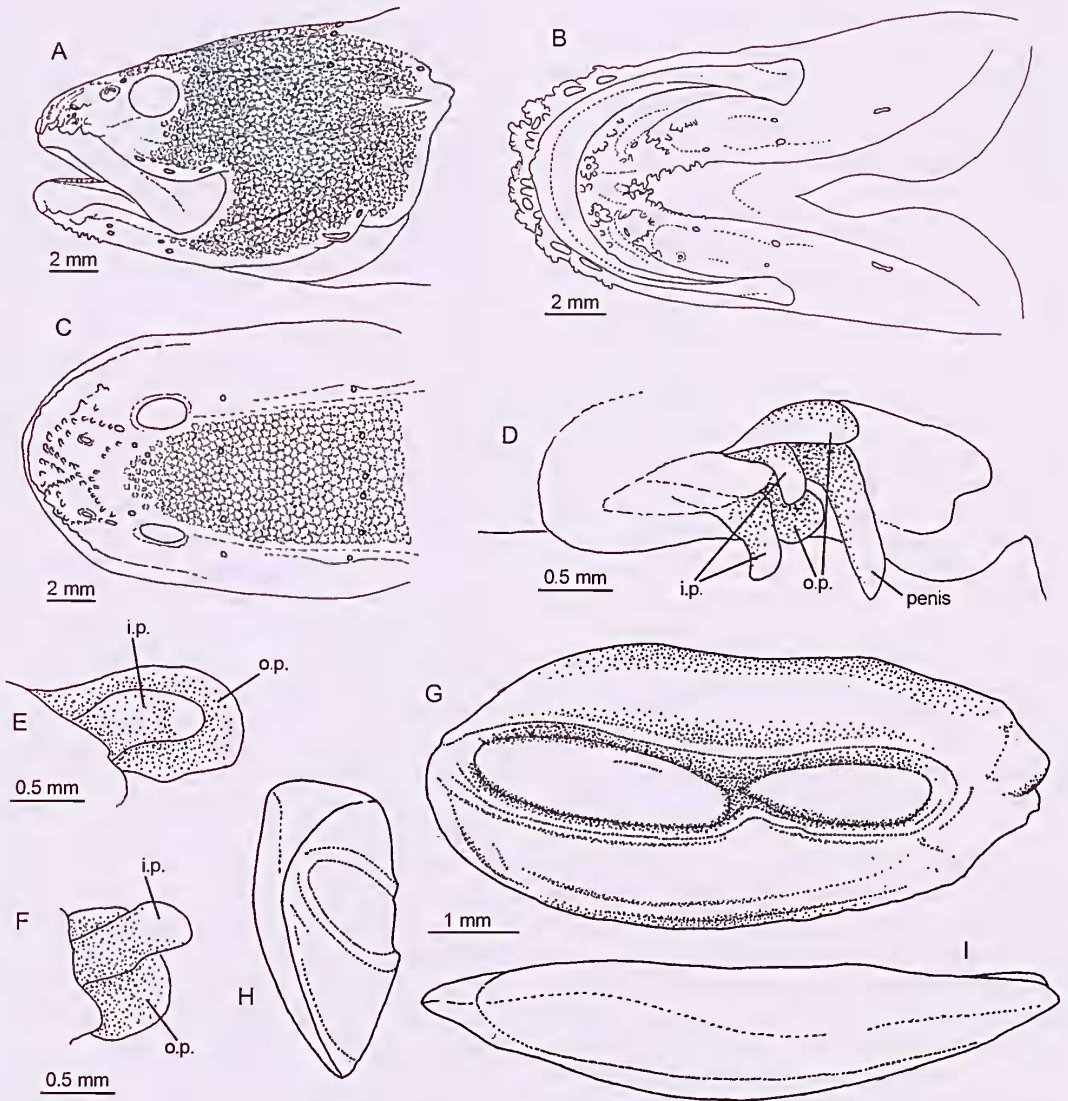


Fig. 36. *Porocephalichthys dasyrhynchus* (Cohen and Hutchins, 1982), A, lateral view of head, WAM P.27950-011, male, 64 mm SL; B, ventral view of head, WAM P.27950-011, male, 64 mm SL; C, dorsal view of head, WAM P.27950-011, male, 64 mm SL; D, inclined lateral view of male copulatory organ, WAM P.27950-011, male, 61 mm SL; E, view of left pseudoelaspers from inside, WAM P.27950-011, male, 64 mm SL; F, view of left pseudoelaspers from inside, WAM P.27950-011, male, 61 mm SL; G, median view of right otolith, ZMUC P77726, female, 89 mm SL; H, anterior view of right otolith, ZMUC P77726, female, 89 mm SL; I, dorsal view of right otolith, ZMUC P77726, female, 89 mm SL.

Table 15. Meristic and morphometric characters of *Porocephalichthys dasyrhynchus* (Cohen and Hutchins, 1982).

	Holotype WAM P.26614- 010*	Holotype + 6 paratypes and 6 non-types	n
		Mean (range)	
Standard length in mm	88	74.8 (43-102)	13
Meristic characters			
Dorsal fin rays	96	99.4 (96-104)	9
Caudal fin rays	18	17.3 (17-18)	7
Anal fin rays	62	66.4 (62-69)	9
Pectoral fin rays	25	26.5 (25-28)	13
Precaudal vertebrae	14	14	9
Caudal vertebrae	33	34.1 (33-35)	9
Total vertebrae	47	48.1 (47-49)	9
Rakers on anterior gill arch	23	21.3 (19-26)	12
Pseudobranchial filaments	-	2	9
D/V	-	5	5
D/A	-	39.2 (37-43)	5
V/A	-	16.8 (16-17)	5
Morphometric characters in % of SL			
Head length	26.1	26.4 (24.6-28.1)	12
Head width	-	12.7 (11.1-15.9)	9
Head height	-	15.4 (14.2-16.6)	9
Snout length	6.3	6.3 (5.5-7.2)	13
Upper jaw length	13.6	13.2 (12.5-13.9)	13
Diameter of pigmented eye	2.8	3.0 (2.6-3.4)	13
Diameter of pupil	-	1.8 (1.7-2.1)	9
Interorbital width	5.6	5.6 (5.1-6.0)	13
Posterior maxilla height	4.9	4.3 (3.2-5.4)	13
Postorbital length	-	18.2 (17.6-18.6)	5
Precanal length	56.8	52.7 (48.8-56.8)	13
Predorsal length	28.4	28.1 (25.6-30.4)	13
Body depth at origin of anal fin	20.5	16.4 (13.7-20.5)	12
Pectoral fin length	12.5	12.3 (11.7-13.5)	13
Pectoral fin base height	-	6.4 (6.0-7.7)	9
Ventral fin length	22.7	23.3 (18.6-28.1)	13
Base ventral fin - anal fin origin	-	32.4 (29.5-36.3)	9

* Data from Cohen and Hutchins (1982).

Description (Figs 35, 36). The principal meristic and morphometric characters are shown in Table 15. Mature at about 60 mm SL. Body slender, with pointed head profile. Many cirri on snout. Eye size 2.6–3.4 (2.8)% SL. Head with uniform and continuous squamation on cheeks, opercle and occiput. Horizontal diameter of scales on body of 89 mm SL female 1.3% SL, in about 33 horizontal rows. Maxillary ending far behind eye, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end expanded. Anterior nostril positioned high, 1/2.5 distance from upper lip to anterior margin of eye. Posterior nostril moderately small, about one-quarter the size of eye. Opercular spine with free tip, pointed. Anterior gill arch with 19–26 (23) short rakers, none elongate. Pseudobranchial filaments 2.

Head sensory pores (Fig. 36A–C). Supraorbital pores 7: 4 additional pairs of supraorbital pores as follows: 1 pair above and in front of eyes, a second above and behind eyes, 2 more pairs on occiput in prolongation of upper preopercular pore. Infraorbital pores 6 (3 anterior and 3 posterior), 3 posterior pores about half size of three anterior pores. Mandibular pores 7–8 (3 anterior and 4–5 posterior): first anterior pore large, tubular; one or two additional posterior mandibular pores oriented in separate, though incomplete, row parallel to original one and closer to jaw. Preopercular pores: 3 lower, first and second with joined opening, covered by dermal flap in lateral view, third non-tubular; upper preopercular pore present. [See description of *Alionematischthys ceylonensis* for position of pores.]

Dentition (of holotype). Premaxilla with 11 outer rows of granular teeth and 1 inner row of larger teeth. Anteriormost teeth in inner row up to 1/5 diameter of pupil. Vomer triangular, with 10 outer rows of small teeth and 1 inner row of larger teeth up to 1/6 diameter of pupil. Palatine with 7 outer rows of small teeth and 1 inner row of larger teeth up to 1/6 diameter of pupil. Dentary with 9 outer rows of granular teeth and 1 inner row of larger teeth, up to about 1/4 diameter of pupil.

Otolith (Fig. 36G–I). Moderately elongate in shape, length to height 2.2 and moderately thick (otolith height to otolith thickness about 2). Anterior tip rounded, posterior tip rounded, slightly expanded. Dorsal rim thick, shallow, with slight and broad depression at its middle. Inner face convex, outer face slightly concave to flat, both smooth. Suleus very long, almost opening anteriorly, otolith length to suleus length 1.2. Suleus slightly supramedially positioned and slightly inclined, with separated colliculi and marked notch at ventral rim of suleus at joint of ostium with cauda. Ostium length to cauda length 1.2–1.5. Ventral furrow distinct, close to ventral rim of otolith.

Axial skeleton. Neural spine of vertebra 4 inclined and 5–10 depressed. Parapophyses present from vertebrae 6 to 14. Pleural ribs on vertebrae 2 to 13. First anal fin pterygiophore much longer than subsequent pterygiophore, reaching tip of last precaudal parapophysis.

Male copulatory organ (Fig. 36D–F). Two pairs of pseudoelaspers, outer not extending beyond hood in resting position. Outer pseudoelasper simple flap-shaped without broadened base; inner pseudoelasper about length of outer pseudoelasper or longer, reduced to stick-like inwardly bent supporter. Isthmus moderately narrow; penis curved, slightly longer than outer pseudoelaspers.

Colour. Live colour uniformly orange-brown (Allen 1985: 2268). Preserved colour uniformly light brown.

Comparison. See comparison between *Porocephalichthys* and other genera above.

Distribution. Restricted in distribution to SW Australia, around Perth and Rottnest Island (Fig. 30). The types were collected in limestone reef habitats, at depths of 3–15 m.

DISCUSSION

The fishes of the genera *Dinematichthys* and *Alionematichthys* reviewed herein represent by far the most common Dinematichthyini in the Indo-west Pacific, comprising more than two-thirds of all investigated specimens from the area. Both genera are particularly common in reef core and outer reef environments, where they often dominate the dinematichthyine samples, but are less dominant in back reef/inshore and lagoonal environments. They are entirely missing from locations outside of the Indo-west Pacific reef belt (except for *A. minyomma* from the Caribbean Sea). The tropical western Indian Ocean is dominated by *Dinematichthys iluocoeteoides*; less so in the eastern Indian Ocean and western Pacific, where various species of the genus *Alionematichthys* dominate. In the latter region, the genus *Diancistrus* (see Schwarzhans and Møller (2005)) usually occurs associated with, or as competitor of, *Alionematichthys* and *Dinematichthys*. Other dinematichthyine genera seem to be more adapted to reef-associated niches in lagoon or near-shore environments (see Schwarzhans and Møller (2007)).

Dinematichthys and *Alionematichthys* represent the genera with the widest geographical distribution in the tribe. *Dinematichthys* from the western Indian Ocean to the western Pacific, absent only from the southeastern Polynesian Islands; *Alionematichthys* is apparently not found west of Sri Lanka, but reaches far east to Ducie Atoll, Pitcairn Group, and constitutes the only dinematichthyine genus which is represented in both the Indo-west Pacific and the tropical western Atlantic by *A. minyomma*. Like most other Dinematichthyini, the genera dealt with in this last part of the review exhibit some restricted geographic distribution patterns, but with fewer species than in the similarly widely distributed genus *Diancistrus*. However, the fishes dealt with in this review also contain some of the most widespread species of the group, particularly *Dinematichthys iluocoeteoides* (East Africa to Ogasawara) and *Alionematichthys piger* (Andaman Islands to Ducie Atoll). *Alionematichthys riukiuensis* is remarkable for its large size. It can attain up to 150 mm SL, second in length only to *Dipulus caecus* (up to 200 mm SL), but due to its massive appearance it is certainly the foremost of all the Dinematichthyini in body mass.

REGIONAL CHECKLIST

The purpose of the following regional check list is to facilitate a quick approach for cross-checking when analyzing a collection of dinematchthyine fishes. The regions are chosen to fit best with the geographic distribution patterns observed in fishes of this group. Species considered endemic to a particular region are underlined. It has to be mentioned though that certain regions are under-represented due to limited sampling, such as the Andaman Sea, the Gulf of Oman, the Banda and Celebes Seas of Indonesia, the Solomon Islands and Madagascar. It is recommended

that readers consult the check list of neighbouring areas in these instances as well, since the lack of species is probably artificial. Other areas have remained virtually unsampled for Dinematchthyini, such as the tropical East African shores, the Spratly Islands, Timor or the Natuna Islands (South China Sea). Such areas could harbour further unknown endemic species. Finally, we provide a key to all currently recognised genera of Dinematchthyini. To key out a species, readers need to use all six individual papers in the revision: Møller *et al.* 2004a, Møller *et al.* 2005, Schwarzhans *et al.* 2005, Møller and Schwarzhans 2006, Schwarzhans and Møller 2007, plus the present paper.

Red Sea and Gulf of Aden

Dinematchthys ihuocoeteoides

Arabian Sea and Gulf of Oman

Dinematchthys ihuocoeteoides

East Africa south of 5°N

Dinematchthys ihuocoeteoides

Mascarenichthys sp.

Seychelles and Mascarenes

Dinematchthys ihuocoeteoides

Mascarenichthys heemstrai

Madagascar

Dinematchthys ihuocoeteoides

Majungaichthys simplex

South Africa south of 30°S

Dermatopsoides andersoni

Dermatopsoides kasongae

Dermatopsoides talboti

Mascarenichthys microphthalms

Chagos Archipelago and Maldives

Diancistrus allenii

Dinematchthys ihuocoeteoides

Sri Lanka

Alionematchthys ceylonensis

Dinematchthys ihuocoeteoides

Andamans, Thailand, Malaya and Sumatra

Alionematchthys phuketensis

Alionematchthys piger

Alionematchthys riukiensis

Diancistrus sp.

Dinematchthys ihuocoeteoides

Eusurculus andamanensis

Ungusurculus riauensis

Christmas and Cocos Islands

Dinematchthys trilobatus

North Vietnam and Hainan Island, China

Alionematchthys piger

Alionematchthys riukiensis

Diancistrus vietnamensis

Kagoshima Islands, Japan

Alionematchthys piger

Alionematchthys riukiensis

Diancistrus erythraeus

Diancistrus fuscus

Dinematchthys ihuocoeteoides

Ryukyu Islands, Japan

Alionematchthys piger

Alionematchthys riukiensis

Alionematchthys shimoharai

Diancistrus erythraeus

Diancistrus fuscus

Diancistrus jackrandalli

Diancistrus sp.

Dinematchthys ihuocoeteoides

Taiwan and Philippines north of 15°N

Alionematchthys crassiceps

Alionematchthys piger

Alionematchthys riukiensis

Brotulinella taiwanensis

Diancistrus erythraeus

Diancistrus fuscus

Diancistrus machidai

Dinematchthys ihuocoeteoides

Sulu Sea and Philippines south of 15°N

Alionematchthys piger

Alionematchthys plicatosurculus

Alionematchthys suluensis

Alionematchthys riukiensis

Diancistrus erythraeus

Diancistrus fuscus

Diancistrus karinae

Diancistrus machidai

Diancistrus springeri

Dinematchthys ihuocoeteoides

Paradiancistrus cuvoensis

Ungusurculus philippinensis

Ungusurculus williamsi

Celebes Sea

Alionematchthys piger

Alionematchthys riukiensis

Diancistrus altidorsalis

Diancistrus beateae

Diancistrus karinae

Diancistrus machidai

Dinematchthys ihuocoeteoides

Sunda Archipelago and Indonesian Timor Sea

Beaglichthys bleekeri

Diancistrus allenii

Diancistrus altidorsalis

Diancistrus beateae

Diancistrus machidai

Diancistrus novaeguineae

Diancistrus springeri

Dinematchthys ihuocoeteoides

Paradiancistrus lombokensis

Ungusurculus komodoensis

Ungusurculus sundaensis

Banda Sea and NW New Guinea

Alionematchthys piger

Alionematchthys plicatosurculus

Diancistrus allenii

Diancistrus altidorsalis

Diancistrus machidai

Diancistrus niger

Diancistrus novaeguineae

Dinematchthys ihuocoeteoides

Ogasawara Islands, Japan

Dinematchthys ihuocoeteoides

Belau, Guam, Caroline Islands including Pohnpei

Alionematischthys crassiceps
Alionematischthys piger
Diancistrus atollorum
Diancistrus beateae
Diancistrus karinae
Diancistrus pohnpeiensis
Dinematichthys ihuocoeteoides

Marshall and Gilbert Islands

Alionematischthys piger
Diancistrus atollorum
Diancistrus beateae
Diancistrus mennei
Dinematichthys ihuocoeteoides

Bismarck Archipelago and NE New Guinea

Alionematischthys crassiceps
Alionematischthys piger
Alionematischthys plicatosurculus
Alionematischthys riukinensis
Diancistrus alleni
Diancistrus altidorsalis
Diancistrus atollorum
Diancistrus beateae
Diancistrus eremitus
Diancistrus karinae
Diancistrus mcgroutheri
Diancistrus novaeguineae
Dinematichthys ihuocoeteoides
Eusurculus pristinus
Ungusurculus collettei

Solomon Islands

Alionematischthys piger
Alionematischthys plicatosurculus
Alionematischthys riukinensis
Diancistrus alleni
Diancistrus altidorsalis
Diancistrus beateae
Diancistrus eremitus
Diancistrus novaeguineae
Dinematichthys ihuocoeteoides
Eusurculus pristinus

NW Australia W of 142°E & N of 25°S

Alionematischthys piger
Alionematischthys riukinensis
Alionematischthys sp.
Beaglichthys bleekeri
Beaglichthys larsonae
Beaglichthys macrophthalmus
Brosmolus longicaudus
Diancistrus alleni
Diancistrus beateae

Diancistrus jeffjohnsoni
Diancistrus novaeguineae
Didymothallus criniceps
Didymothallus mizolepis
Dinematichthys ihuocoeteoides
Dipulus hutchinsi
Eusurculus pistillum

Great Barrier Reef and SE New Guinea

Alionematischthys piger
Alionematischthys riukinensis
Alionematischthys sp.
Beaglichthys macrophthalmus
Diancistrus alleni
Diancistrus beateae
Diancistrus leisi
Diancistrus longifilis
Diancistrus mcgroutheri
Diancistrus novaeguineae
Didymothallus criniceps
Dinematichthys ihuocoeteoides
Eusurculus pistillum

SW Australia W of 145°E and S of 25°S

Dactylosurculus gomoni
Dermatopsoides morrisonae
Dipulus caecus
Dipulus hutchinsi
Dipulus multiradiatus
Porocephalichthys dasyrhychnus
Zephyrichthys barryi

SE Australia E of 145°E and S of 25°S

Dermatopsis hoesei
Dermatopsis macrodon
Monothrix polylepis

Lord Howe Island

Alionematischthys piger
Diancistrus longifilis

New Zealand, North Island

Dermatopsis joergennielsen

Norfolk Island

Dipulus norfolkanus

New Caledonia

Alionematischthys piger
Alionematischthys riukinensis
Diancistrus longifilis
Didymothallus pruvosti
Lapitaichthys frickei

Loyalty Islands and Vanuatu

Alionematischthys crassiceps
Alionematischthys piger
Alionematischthys riukinensis
Diancistrus alleni
Diancistrus beateae
Diancistrus brevirostris
Diancistrus longifilis
Diancistrus novaeguineae
Diancistrus tongaensis
Dinematichthys ihuocoeteoides
Eusurculus pristinus
Paradiancistrus acutirostris

Fiji

Alionematischthys crassiceps
Alionematischthys piger
Alionematischthys winterbottomi
Dermatopsis greenfieldi
Diancistrus beateae
Diancistrus eremitus
Diancistrus fijiensis
Diancistrus robustus
Diancistrus tongaensis
Dinematichthys ihuocoeteoides

Tonga

Alionematischthys crassiceps
Alionematischthys piger
Alionematischthys winterbottomi
Diancistrus alatus
Diancistrus manciporus
Diancistrus tongaensis
Dinematichthys ihuocoeteoides

Samoa

Alionematischthys samoaensis
Diancistrus alleni
Diancistrus beateae
Diancistrus tongaensis
Dinematichthys ihuocoeteoides

Cook, Tubuai and Society Islands, Pitcairn (inc. Ducie Atoll)

Alionematischthys piger
Diancistrus katrineae
Diancistrus tongaensis
Diancistrus sp.

Key to the genera of the Dinematichthyini

- 1a. Head with continuous squamation on cheeks, opercle and occiput 2
- 1b. Head with squamation patches on cheeks, and occasionally also on opercle or without scales 3
- 2a. Precaudal vertebrae 14; dorsal fin rays >95; no canine teeth; upper preopercular pore present; 3 pairs of pores on occiput; sulcus of otolith with separate equally long ostial and caudal colliculi *Porocephalichthys*
- 2b. Precaudal vertebrae 10–12; dorsal fin rays <95; canine teeth present; upper preopercular pore absent; no pores on occiput; sulcus of otolith with separate colliculi, length ostial colliculum 2.5–4 times caudal colliculum *Dinematichthys*
- 3a. Anterior nostril positioned high (less than 1/3 the distance from upper lip to aggregate distance to anterior margin of eye) *Alionematichthys*
- 3b. Anterior nostril positioned low (1/3.5 to 1/6 the distance from upper lip to aggregate distance to anterior margin of eye) 4
- 4a. Termination of maxilla low, not expanded 5
- 4b. Termination of maxilla expanded, angular or with knob 8
- 5a. Opercular spine hidden 6
- 5b. Opercular spine exposed 7
- 6a. Single pair of pseudoclasps with two equally long supporters; upper preopercular pore present *Gunterichthys*
- 6b. Single pair of pseudoclasps with single supporter; upper preopercular pore absent *Dermatopsoides*
- 7a. Precaudal vertebrae 11–14; dorsal fin rays 64–85; penis without hook near tip *Dermatopsis*
- 7b. Precaudal vertebrae 13–25; dorsal fin rays 86–191; penis with hook near tip *Dipulus*
- 8a. A single pair of (outer) pseudoclasps 9
- 8b. Two or three pairs of pseudoclasps 13
- 9a. Two long supporters in pseudoclasps *Didymothallus*
- 9b. Single supporter in pseudoclasps 10
- 10a. Precaudal vertebrae 11–12; sulcus of otolith with separate colliculi 11
- 10b. Precaudal vertebrae 13–15; sulcus of otolith with undivided colliculi 12
- 11a. Pseudoclasps simple flap with small hook at middle of anterior rim *Lapitaichthys*
- 11b. Pseudoclasps long and stick-like *Ogilbia mccoskeri*
[note: only species of genus *Ogilbia* with single pseudoclasps]
- 12a. Upper preopercular pore absent; dorsal fin rays 124–129; anal fin rays 90–94; total vertebrae 55–59; D/A 37–42 *Brosmolus*
- 12b. Upper preopercular pore present; dorsal fin rays 93–104; anal fin rays 64–76; total vertebrae 45–47; D/A 28–35 *Monothrix*
- 13a. 3 pairs of pseudoclasps 14
- 13b. 2 pairs of pseudoclasps 15
- 14a. Inner pseudoclasps separated into an anterior and a posterior pseudoclasps, pseudoclasps not joined at base; 6–7 branchiostegal rays; 11 precaudal vertebrae; pectoral fin rays 16–21; first and second lower preopercular pore joined in a single opening *Ogilbichthys*
- 14b. Second inner pseudoclasps inserted between first inner pseudoclasps and outer pseudoclasps; pseudoclasps joined at base; 8–9 branchiostegal rays; 13–14 precaudal vertebrae; pectoral fin rays 22–26; first and second preopercular pores with separate openings *Dactylosarcus*
- 15a. Upper preopercular pore absent 16
- 15b. Upper preopercular pore present 20
- 16a. No scales on head; specimens longer than 20 mm SL without visible eyes, only minute black dots in specimens less than 20 mm SL *Typhliasina*
- 16b. Scales on cheeks; all specimens with visible eyes 17
- 17a. First and second preopercular pores with separate openings 18
- 17b. First and second lower preopercular pore joined in a single opening 19
- 18a. Inner pseudoclasps anteriorly connected to outer pseudoclasps; sulcus of otolith with undivided colliculi *Beaglichthys*
- 18b. Inner pseudoclasps branched, medially connected to outer pseudoclasps; sulcus of otolith with separate colliculi, cauda short *Zephyrichthys*
- 19a. Inner pseudoclasps concave, anteriorly connected to outer pseudoclasps; precaudal vertebrae 11 *Diancistrus manciporus*
[note: only species of genus *Diancistrus* without upper preopercular pore]
- 19b. Inner pseudoclasps claw-like; precaudal vertebrae 12 *Ungusarcus*

- 20a. Single lower preopercular pore 21
- 20b. Three lower preopercular pores, but first and second pore open into single opening..... 22
- 21a. Inner pseudoelasper about as large as outer pseudoelasper and separate.....*Pseudogilbia*
- 21b. Inner pseudoelasper half the size of outer pseudoelasper and anteriorly connected to U-shaped structure
.....*Paradancistrus*
- 22b. Inner pseudoelasper anteriorly joined to outer pseudoelasper..... 23
- 22a. Inner and outer pseudoelaspers free 24
- 23a. Body slender (head height $\leq 15\%$ SL, depth at anal $\leq 16\%$ SL); precaudal vertebrae predominantly 12 (rarely 11); maxilla rounded posterior-ventrally with weak knob in front of rear corner; body scales small, $< 1.2\%$ SL *Brotulinella*
- 23b. Body robust, moderately slender to deep (head height $> 15\%$ SL except for *Dancistrus jeffjohnsoni*, body depth at anal $> 16\%$ SL except for *Dancistrus longifilis*); precaudal vertebrae 11 (except 12 in *Dancistrus jeffjohnsoni*); maxilla with angular postero-ventral widening close to its termination; body scales (1.2) 1.3–2.2% SL *Dancistrus*
- 24a. Inner pseudoelasper hidden in pocket of isthmus when in resting position; penis hooked
.....*Mascarenichthys*
- 24b. Inner pseudoelasper open; penis bent, but not hooked..... 25
- 25a. Inner pseudoelasper sucker-disk like; supporter of outer pseudoelasper distally expanded and usually with anterior hook *Eusurculus*
- 25b. Inner pseudoelasper simple flap or diversified, but not sucker-disk like; supporter of outer pseudoelasper not expanded and without anterior hook 26
- 26a. Suleus of otolith with separated colliculi *Ogilbia*
- 26b. Suleus of otolith with undivided colliculi
.....*Majungaichthys*

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